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(12) **United States Patent**
Yoshioka

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(54) **SIGNATURE DEVICE AND SIGNATURE METHOD**

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(21) Appl. No.: **14/602,887**

(22) Filed: **Jan. 22, 2015**

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Related U.S. Application Data

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(30) **Foreign Application Priority Data**

Mar. 18, 2011 (JP) 2011-061788

(51) **Int. Cl.**
H04N 5/93 (2006.01)
G06F 21/64 (2013.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06F 21/64*** (2013.01); ***G06K 9/00154*** (2013.01); ***G11B 27/031*** (2013.01); ***G11B 27/19*** (2013.01); ***H04N 1/215*** (2013.01); ***H04N 1/32128*** (2013.01); ***H04N 5/765*** (2013.01); ***H04N 5/93*** (2013.01); ***H04N 5/931*** (2013.01); ***H04N 7/18*** (2013.01); ***H04N 9/8205*** (2013.01); ***H04N 19/40*** (2014.11); ***H04N 19/467*** (2014.11);
(Continued)

(58) **Field of Classification Search**
CPC G06F 17/30843; G06F 17/30017; H04N 21/235; G06Q 50/24
See application file for complete search history.

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(Continued)

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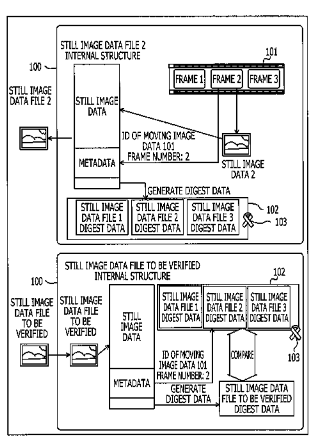
(57) **ABSTRACT**

A signature device including a storage unit configured to store moving image data, and a processor configured to extract original metadata from moving image data for the image data of each of a plurality of images forming the moving image data, the original metadata including location data of the image data and identification data of the moving image data, to encode the image data of each of the images into still image data in accordance with an image format, to write the still image data into a first area, to write the original metadata extracted by the extractor into a second area, the first area and the second area being included in a storage area of a still image data file in which the still image data is filed, and to generate summary data for the still image data file.

4 Claims, 35 Drawing Sheets



(51) **Int. Cl.**

H04N 1/21	(2006.01)
H04N 1/32	(2006.01)
H04N 5/765	(2006.01)
H04N 5/931	(2006.01)
H04N 9/82	(2006.01)
H04N 7/18	(2006.01)
H04N 21/234	(2011.01)
H04N 21/2343	(2011.01)
H04N 21/235	(2011.01)
H04N 21/266	(2011.01)
H04N 21/6334	(2011.01)
H04N 21/6377	(2011.01)
H04N 21/8352	(2011.01)
H04N 21/84	(2011.01)
H04N 21/8549	(2011.01)
H04N 19/60	(2014.01)
H04N 19/467	(2014.01)
H04N 19/40	(2014.01)
G06K 9/00	(2006.01)
G11B 27/031	(2006.01)
G11B 27/19	(2006.01)

(52) **U.S. Cl.**

CPC ***H04N 19/60*** (2014.11); ***H04N 21/2351*** (2013.01); ***H04N 21/23418*** (2013.01); ***H04N 21/234309*** (2013.01); ***H04N 21/26613*** (2013.01); ***H04N 21/63345*** (2013.01); ***H04N 21/63775*** (2013.01); ***H04N 21/8352*** (2013.01); ***H04N 21/84*** (2013.01); ***H04N 21/8549*** (2013.01); *H04N 2201/3205* (2013.01); *H04N 2201/3214* (2013.01); *H04N 2201/3215* (2013.01); *H04N 2201/3232* (2013.01); *H04N 2201/3233* (2013.01); *H04N 2201/3238* (2013.01); *H04N 2201/3249* (2013.01); *H04N 2201/3281* (2013.01)

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Final Office Action issued Oct. 17, 2013 corresponding to U.S. Appl. No. 13/421,092.

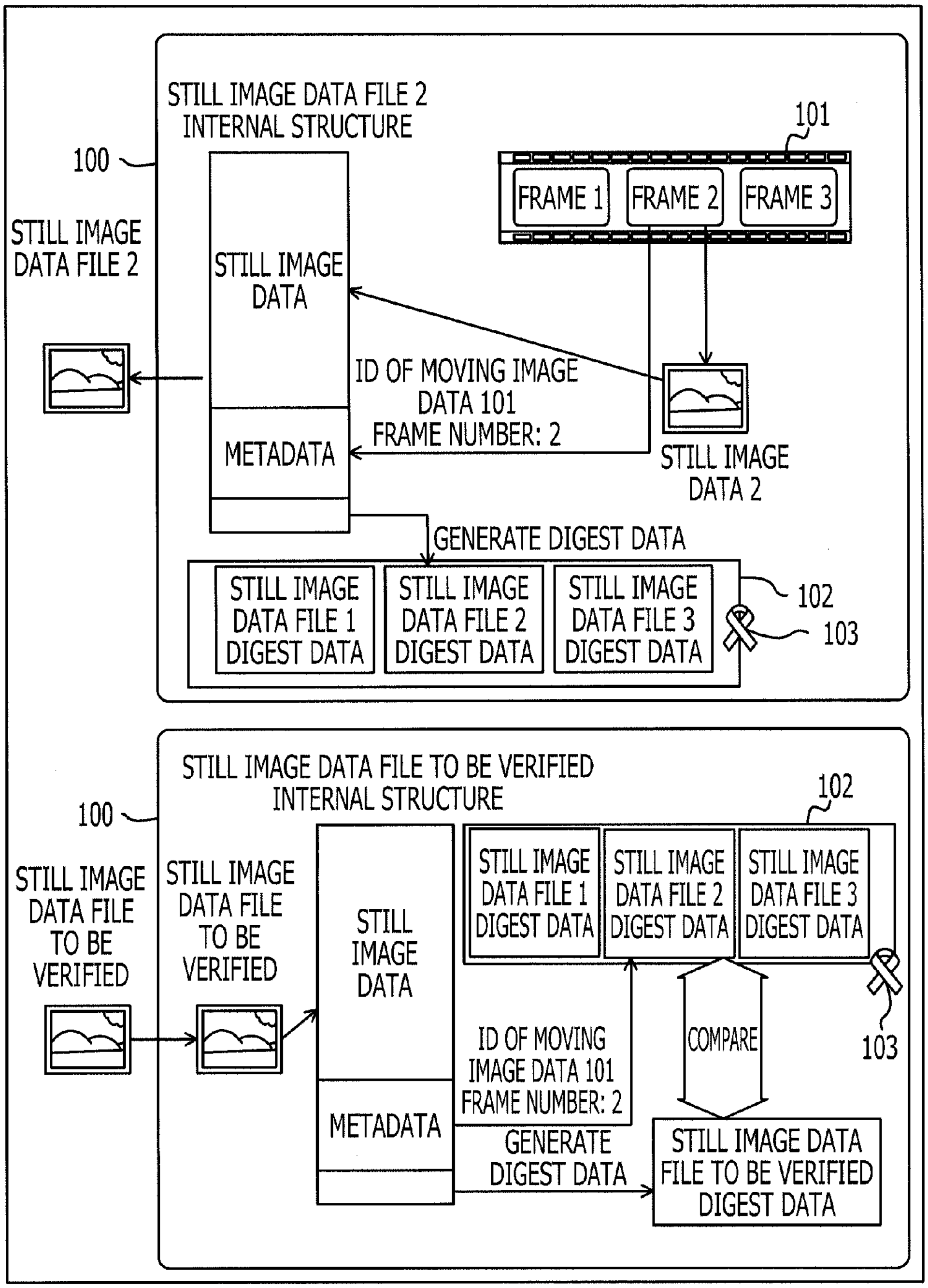
Advisory Action issued Dec. 18, 2013 corresponding to U.S. Appl. No. 13/421,092.

Office Action issued Mar. 6, 2014 corresponding to U.S. Appl. No. 13/421,092.

Final Office Action issued Aug. 28, 2014 corresponding to U.S. Appl. No. 13/421,092.

* cited by examiner

FIG. 1



STILL IMAGE DATA FILE 2 INTERNAL STRUCTURE
100
STILL IMAGE DATA FILE 2
STILL IMAGE DATA
METADATA
101
FRAME 1
FRAME 2
FRAME 3
ID OF MOVING IMAGE DATA 101 FRAME NUMBER: 2
STILL IMAGE DATA 2
GENERATE DIGEST DATA
STILL IMAGE DATA FILE 1 DIGEST DATA
STILL IMAGE DATA FILE 2 DIGEST DATA
STILL IMAGE DATA FILE 3 DIGEST DATA
102
103
STILL IMAGE DATA FILE TO BE VERIFIED INTERNAL STRUCTURE
100
STILL IMAGE DATA FILE TO BE VERIFIED
STILL IMAGE DATA FILE TO BE VERIFIED
STILL IMAGE DATA
METADATA
102
STILL IMAGE DATA FILE 1 DIGEST DATA
STILL IMAGE DATA FILE 2 DIGEST DATA
STILL IMAGE DATA FILE 3 DIGEST DATA
ID OF MOVING IMAGE DATA 101 FRAME NUMBER: 2
COMPARE
103
GENERATE DIGEST DATA
STILL IMAGE DATA FILE TO BE VERIFIED DIGEST DATA

FIG. 2

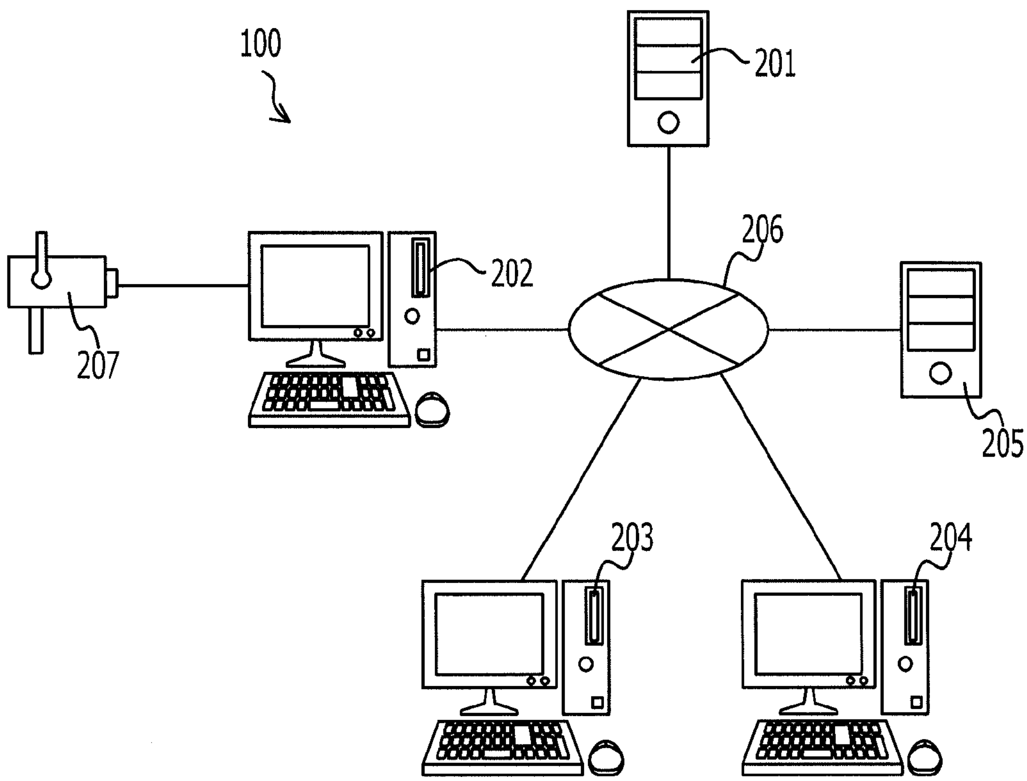
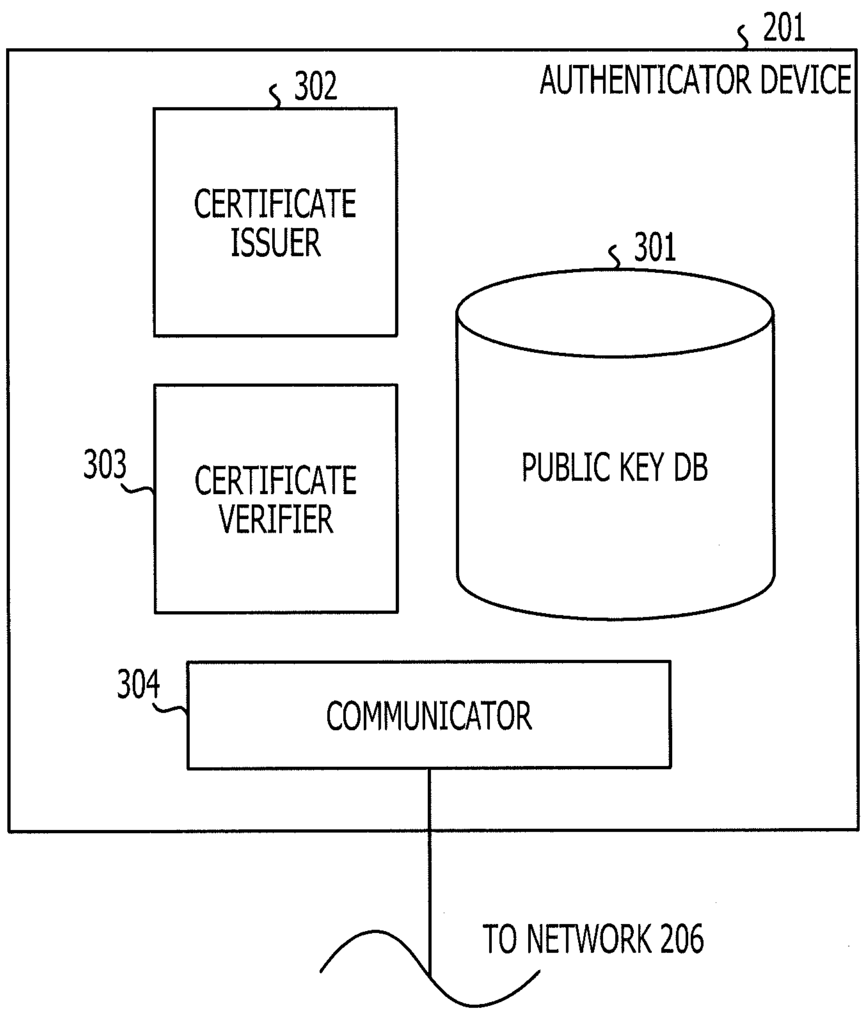


FIG. 3


201
AUTHENTICATOR DEVICE
302
CERTIFICATE ISSUER
301
303
CERTIFICATE VERIFIER
PUBLIC KEY DB
304
COMMUNICATOR
TO NETWORK 206

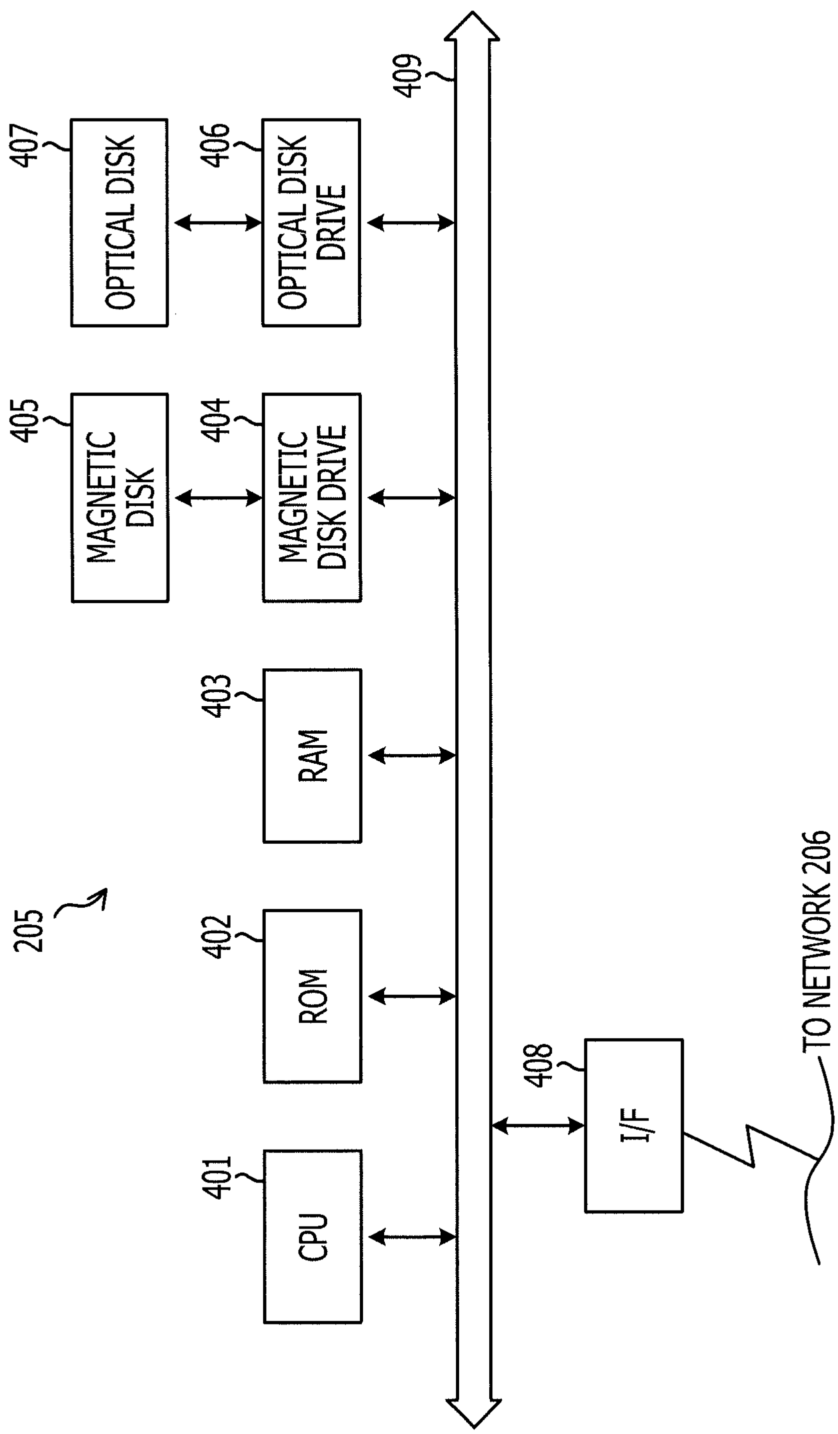

205
401
CPU
402
ROM
403
RAM
404
MAGNETIC DISK DRIVE
405
MAGNETIC DISK
406
OPTICAL DISK DRIVE
407
OPTICAL DISK
408
I/F
409
TO NETWORK 206

FIG. 4

FIG. 5

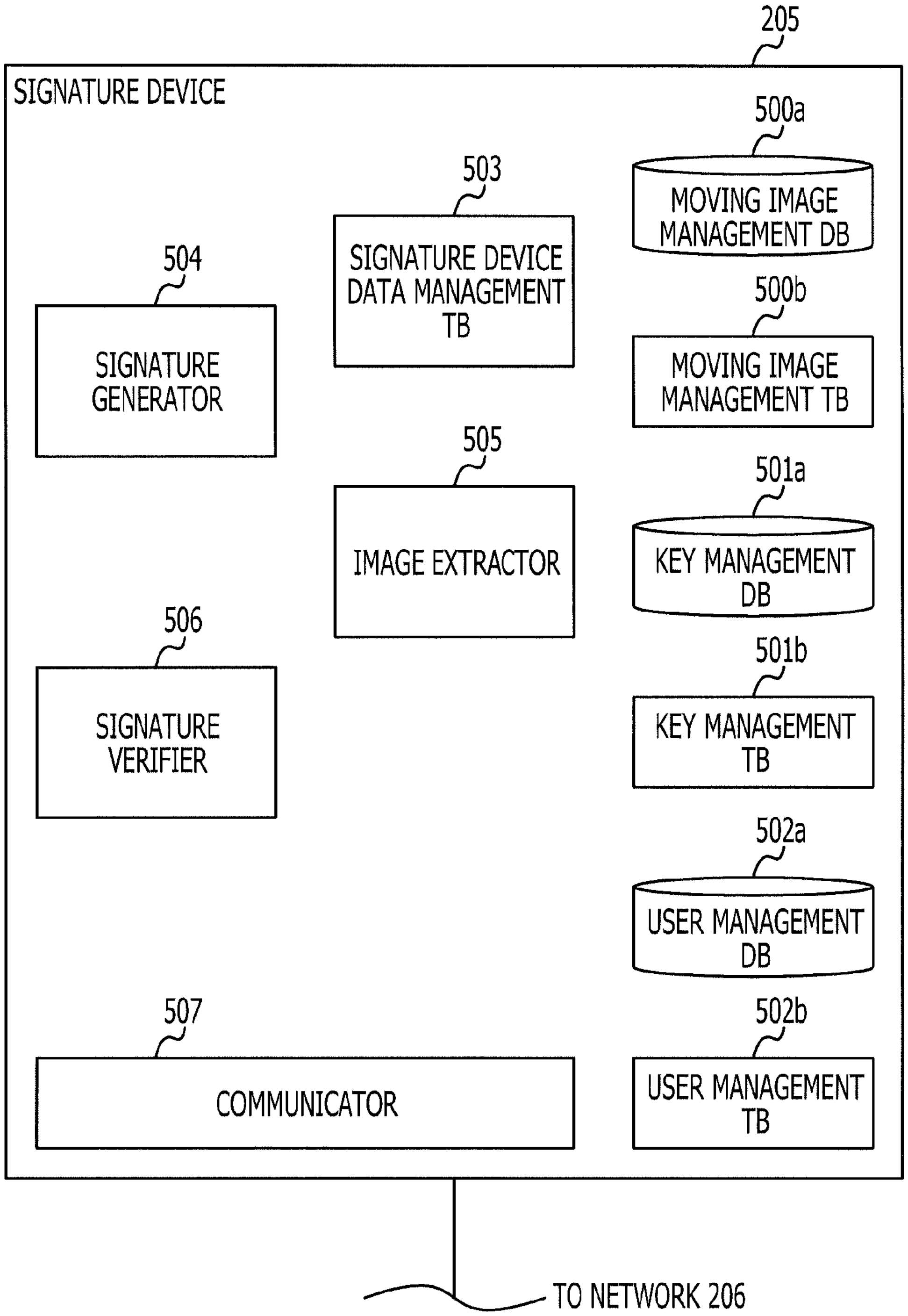

205
SIGNATURE DEVICE
500a
MOVING IMAGE MANAGEMENT DB
503
SIGNATURE DEVICE DATA MANAGEMENT TB
504
SIGNATURE GENERATOR
500b
MOVING IMAGE MANAGEMENT TB
505
IMAGE EXTRACTOR
501a
KEY MANAGEMENT DB
506
SIGNATURE VERIFIER
501b
KEY MANAGEMENT TB
502a
USER MANAGEMENT DB
507
COMMUNICATOR
502b
USER MANAGEMENT TB
TO NETWORK 206

FIG. 6

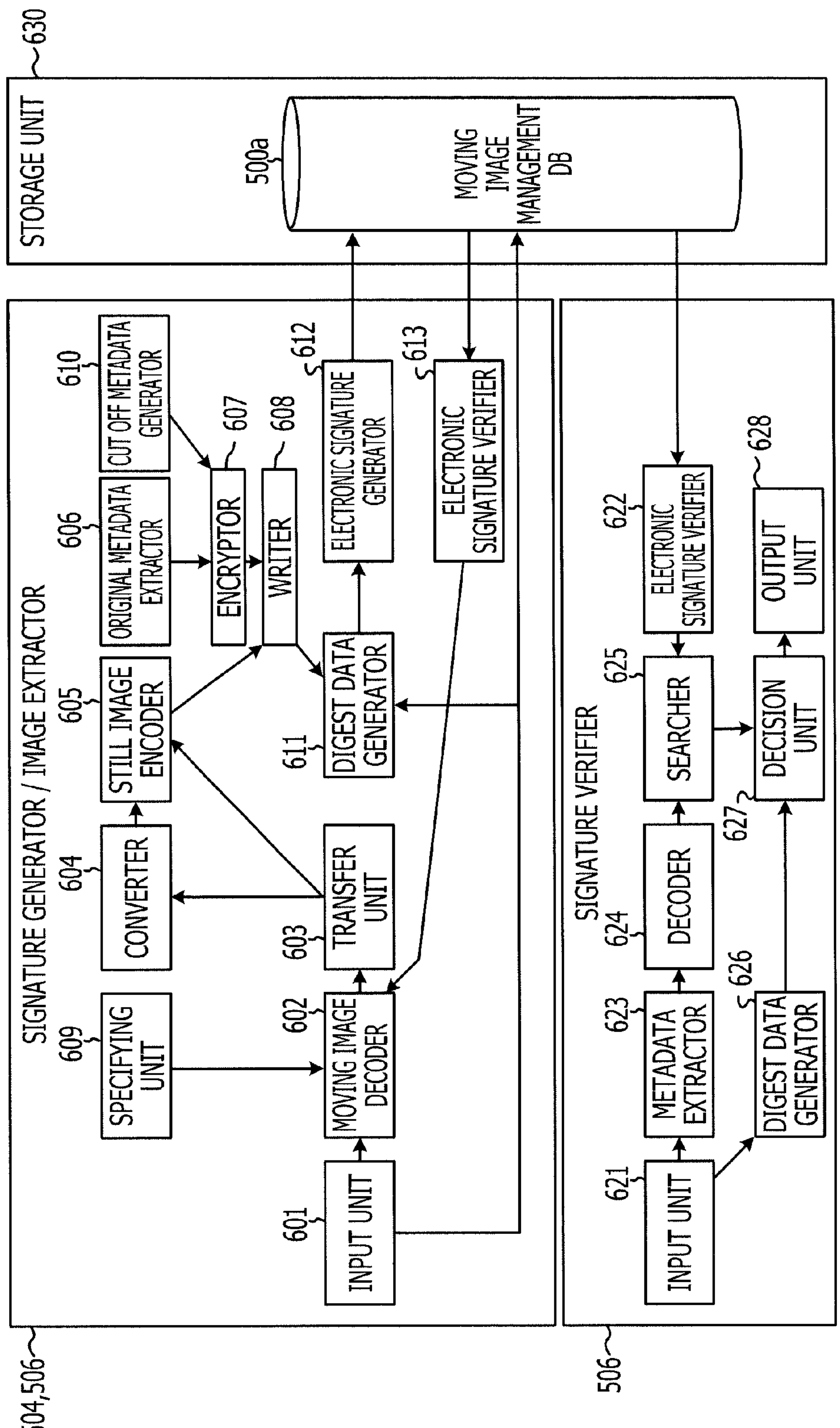

STORAGE UNIT
630
500a
MOVING IMAGE MANAGEMENT DB
SIGNATURE GENERATOR / IMAGE EXTRACTOR
504,506
601
INPUT UNIT
602
MOVING IMAGE DECODER
603
TRANSFER UNIT
604
CONVERTER
605
STILL IMAGE ENCODER
606
ORIGINAL METADATA EXTRACTOR
607
ENCRYPTOR
608
WRITER
609
SPECIFYING UNIT
610
CUT OFF METADATA GENERATOR
611
DIGEST DATA GENERATOR
612
ELECTRONIC SIGNATURE GENERATOR
613
ELECTRONIC SIGNATURE VERIFIER
SIGNATURE VERIFIER
506
621
INPUT UNIT
622
ELECTRONIC SIGNATURE VERIFIER
623
METADATA EXTRACTOR
624
DECODER
625
SEARCHER
626
DIGEST DATA GENERATOR
627
DECISION UNIT
628
OUTPUT UNIT

FIG. 7

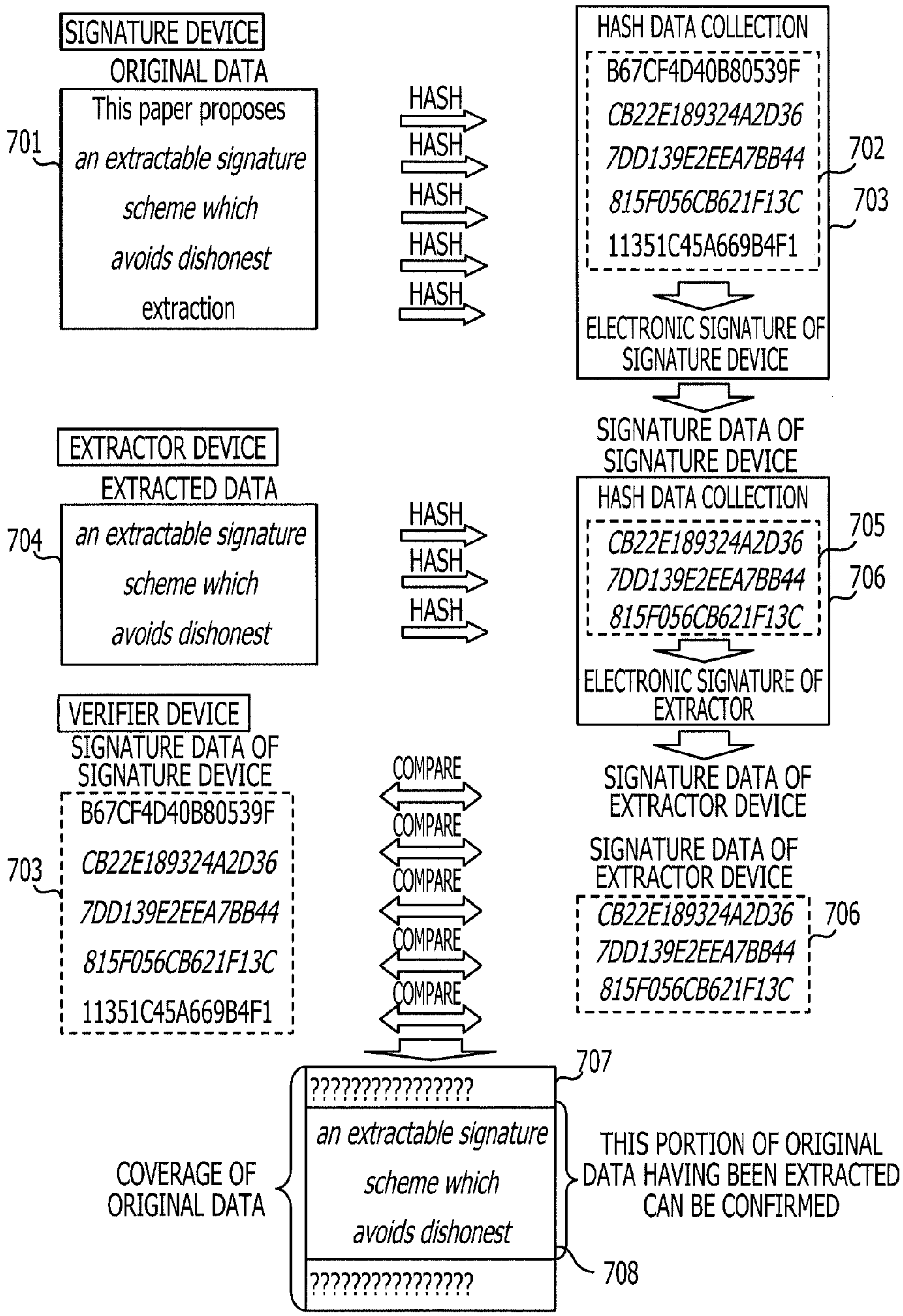

SIGNATURE DEVICE
ORIGINAL DATA
This paper proposes
an extractable signature
scheme which
avoids dishonest
extraction
701
HASH
HASH
HASH
HASH
HASH
HASH DATA COLLECTION
B67CF4D40B80539F
CB22E189324A2D36
7DD139E2EEA7BB44
815F056CB621F13C
11351C45A669B4F1
702
703
ELECTRONIC SIGNATURE OF
SIGNATURE DEVICE
SIGNATURE DATA OF
SIGNATURE DEVICE
EXTRACTOR DEVICE
EXTRACTED DATA
an extractable signature
scheme which
avoids dishonest
704
HASH
HASH
HASH
HASH DATA COLLECTION
CB22E189324A2D36
7DD139E2EEA7BB44
815F056CB621F13C
705
706
ELECTRONIC SIGNATURE OF
EXTRACTOR
SIGNATURE DATA OF
EXTRACTOR DEVICE
VERIFIER DEVICE
SIGNATURE DATA OF
SIGNATURE DEVICE
B67CF4D40B80539F
CB22E189324A2D36
7DD139E2EEA7BB44
815F056CB621F13C
11351C45A669B4F1
703
COMPARE
COMPARE
COMPARE
COMPARE
COMPARE
SIGNATURE DATA OF
EXTRACTOR DEVICE
CB22E189324A2D36
7DD139E2EEA7BB44
815F056CB621F13C
706
????????????????
an extractable signature
scheme which
avoids dishonest
????????????????
707
708
COVERAGE OF
ORIGINAL DATA
THIS PORTION OF ORIGINAL
DATA HAVING BEEN EXTRACTED
CAN BE CONFIRMED

FIG. 8

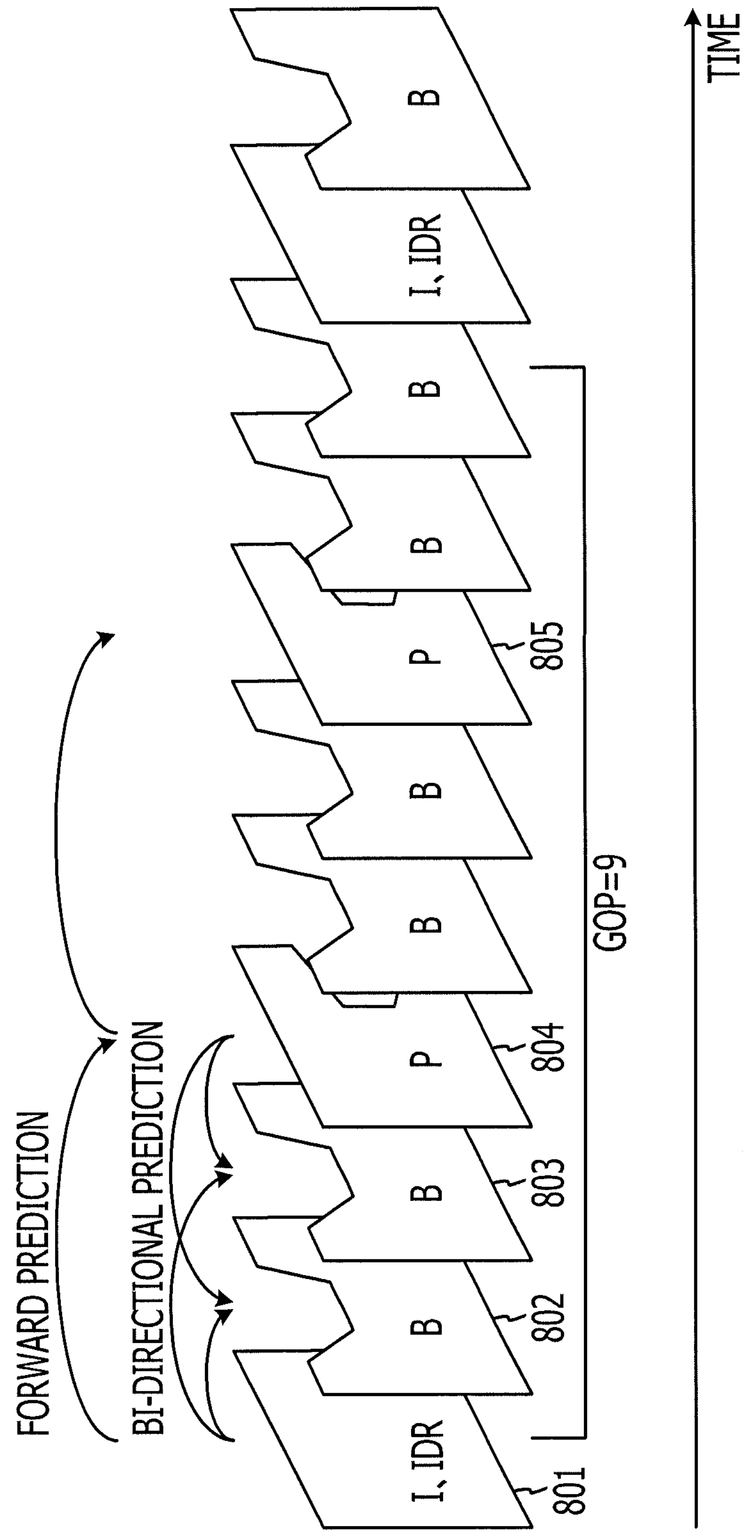

FORWARD PREDICTION
BI-DIRECTIONAL PREDICTION
I, IDR
B
B
P
B
B
P
B
B
I, IDR
B
801
802
803
804
805
GOP=9
TIME

FIG. 9

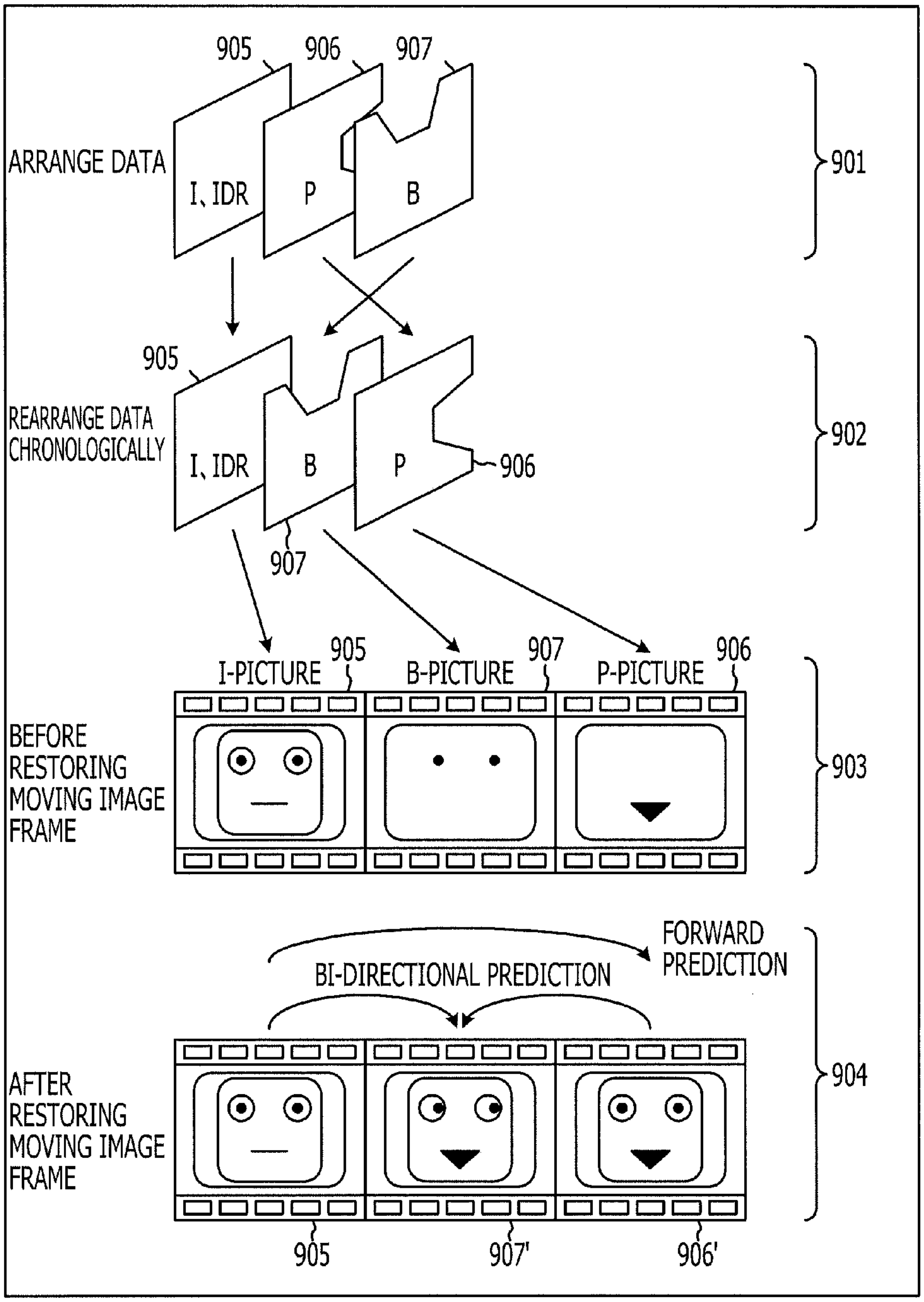

905
906
907
ARRANGE DATA
I、IDR
P
B
901
905
REARRANGE DATA CHRONOLOGICALLY
I、IDR
B
P
906
907
902
I-PICTURE
905
B-PICTURE
907
P-PICTURE
906
BEFORE RESTORING MOVING IMAGE FRAME
903
FORWARD PREDICTION
BI-DIRECTIONAL PREDICTION
AFTER RESTORING MOVING IMAGE FRAME
904
905
907'
906'

FIG. 10

502a

1001

PRODUCER USER DATA LIST

PRODUCER ID	PASSWORD
KIMURA RYUICHI: K19203	**********
GOTO SHUNSAKU: G57831	**********
YAMAMOTO YUJI: Y34819	**********
SATO TARO: S20233	**********

1002

EXTRACTOR USER DATA LIST

EXTRACTOR ID	PASSWORD
SATO TARO: S20233	**********
OTA SABURO: O58192	**********

1003

VERIFIER USER DATA LIST

VERIFIER ID	PASSWORD
TANAKA KOJI: T89101	**********
SAMUKAWA KYOKO: S18291	**********
FURUTA JUN: F10344	**********

USER MANAGEMENT DB

FIG. 11

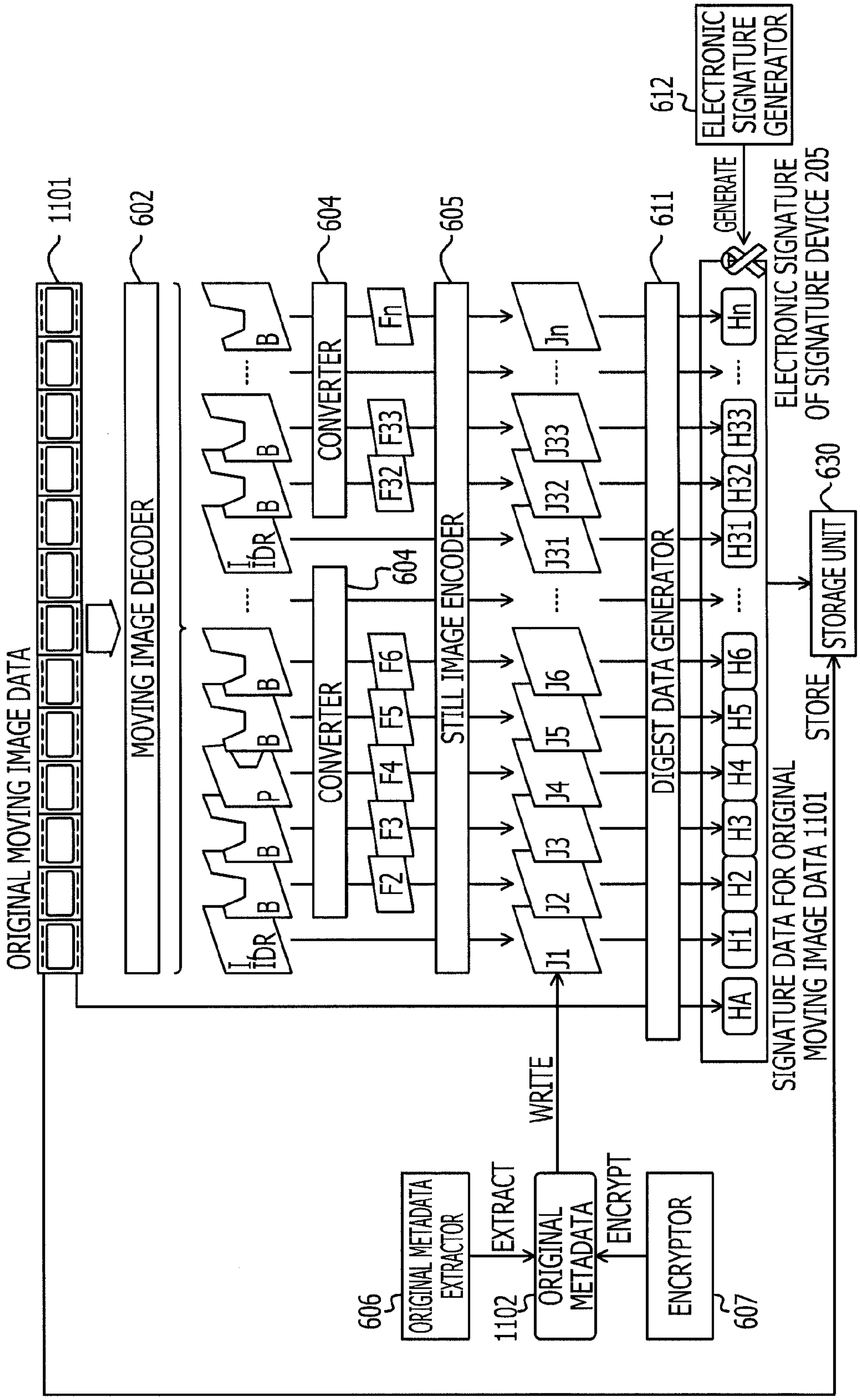

ORIGINAL MOVING IMAGE DATA
1101
602
MOVING IMAGE DECODER
604
CONVERTER
605
STILL IMAGE ENCODER
611
DIGEST DATA GENERATOR
612
ELECTRONIC SIGNATURE GENERATOR
GENERATE
ELECTRONIC SIGNATURE OF SIGNATURE DEVICE 205
SIGNATURE DATA FOR ORIGINAL MOVING IMAGE DATA 1101
630
STORAGE UNIT
STORE
WRITE
606
ORIGINAL METADATA EXTRACTOR
EXTRACT
1102
ORIGINAL METADATA
ENCRYPT
ENCRYPTOR
607
IDR
B
P
F2
F3
F4
F5
F6
F32
F33
Fn
J1
J2
J3
J4
J5
J6
J31
J32
J33
Jn
HA
H1
H2
H3
H4
H5
H6
H31
H32
H33
Hn

FIG. 12

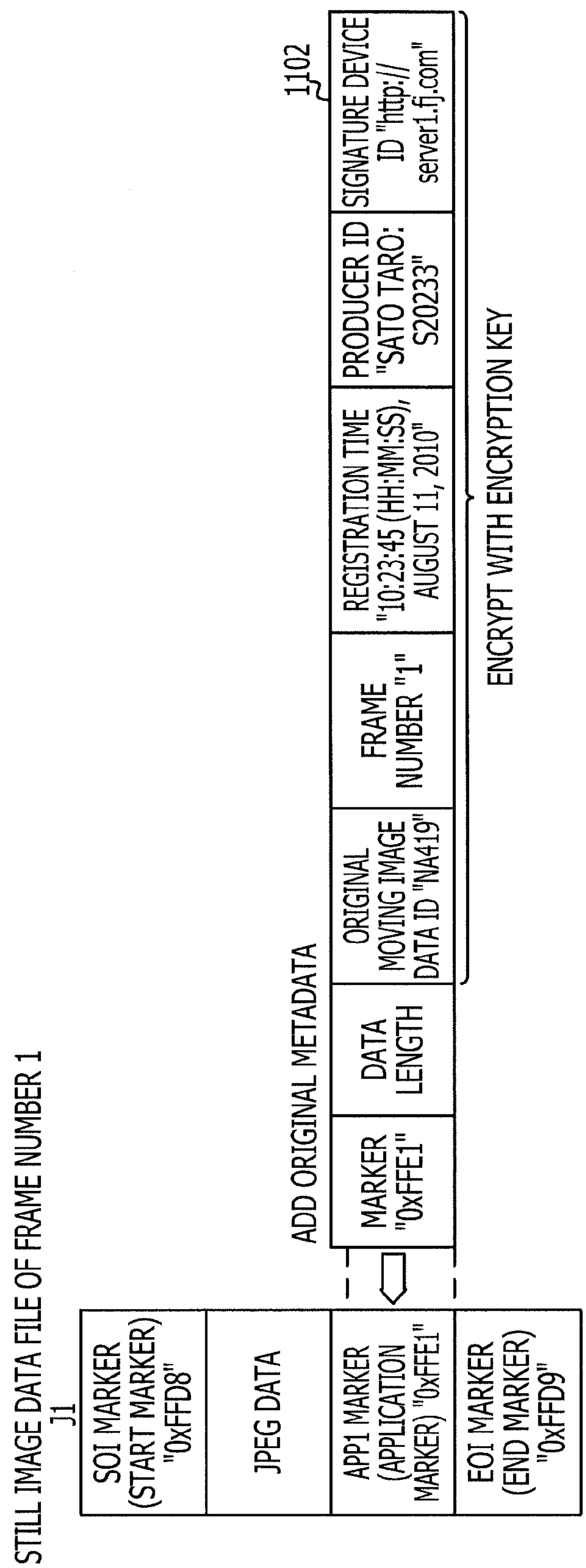

STILL IMAGE DATA FILE OF FRAME NUMBER 1
J1
SOI MARKER (START MARKER) "0xFFD8"
JPEG DATA
APP1 MARKER (APPLICATION MARKER) "0xFFE1"
EOI MARKER (END MARKER) "0xFFD9"
ADD ORIGINAL METADATA
MARKER "0xFFE1"
DATA LENGTH
ORIGINAL MOVING IMAGE DATA ID "NA419"
FRAME NUMBER "1"
REGISTRATION TIME "10:23:45 (HH:MM:SS), AUGUST 11, 2010"
PRODUCER ID "SATO TARO: S20233"
SIGNATURE DEVICE ID "http://server1.fj.com"
1102
ENCRYPT WITH ENCRYPTION KEY

FIG. 13

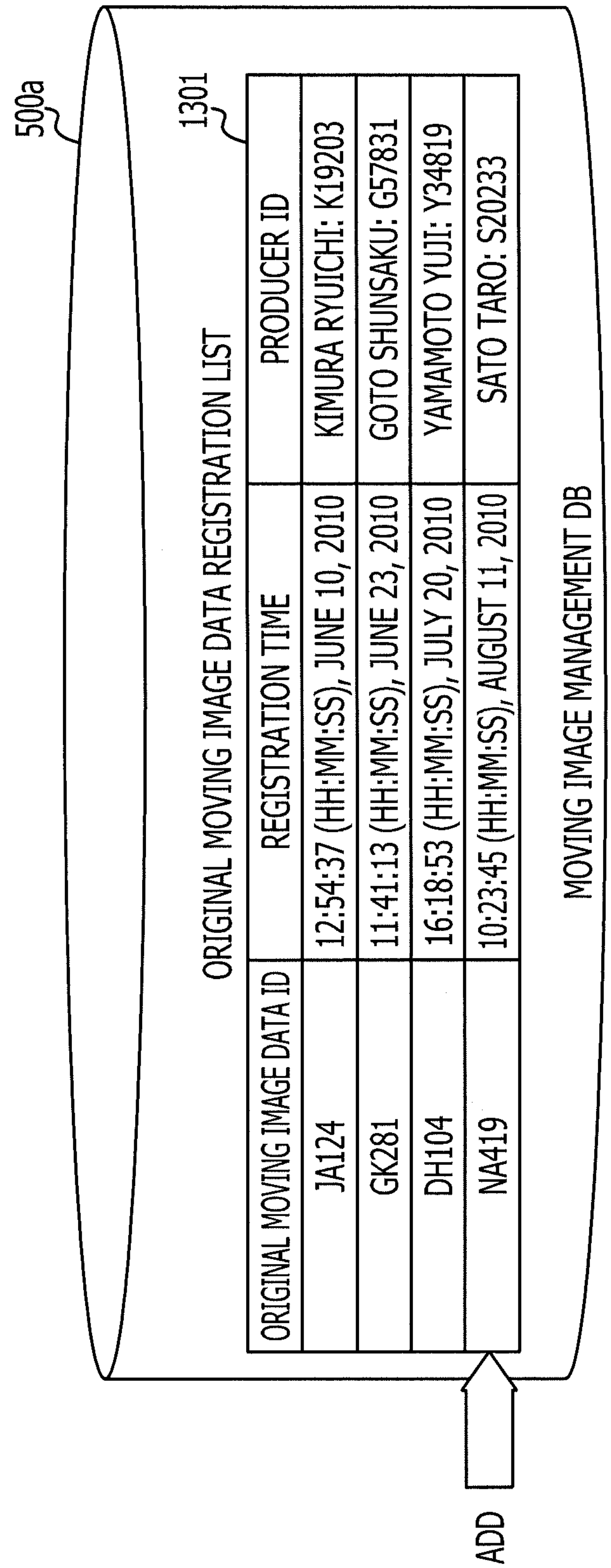

500a
1301
ORIGINAL MOVING IMAGE DATA REGISTRATION LIST
ORIGINAL MOVING IMAGE DATA ID
REGISTRATION TIME
PRODUCER ID
JA124
12:54:37 (HH:MM:SS), JUNE 10, 2010
KIMURA RYUICHI: K19203
GK281
11:41:13 (HH:MM:SS), JUNE 23, 2010
GOTO SHUNSAKU: G57831
DH104
16:18:53 (HH:MM:SS), JULY 20, 2010
YAMAMOTO YUJI: Y34819
NA419
10:23:45 (HH:MM:SS), AUGUST 11, 2010
SATO TARO: S20233
MOVING IMAGE MANAGEMENT DB
ADD

FIG. 14

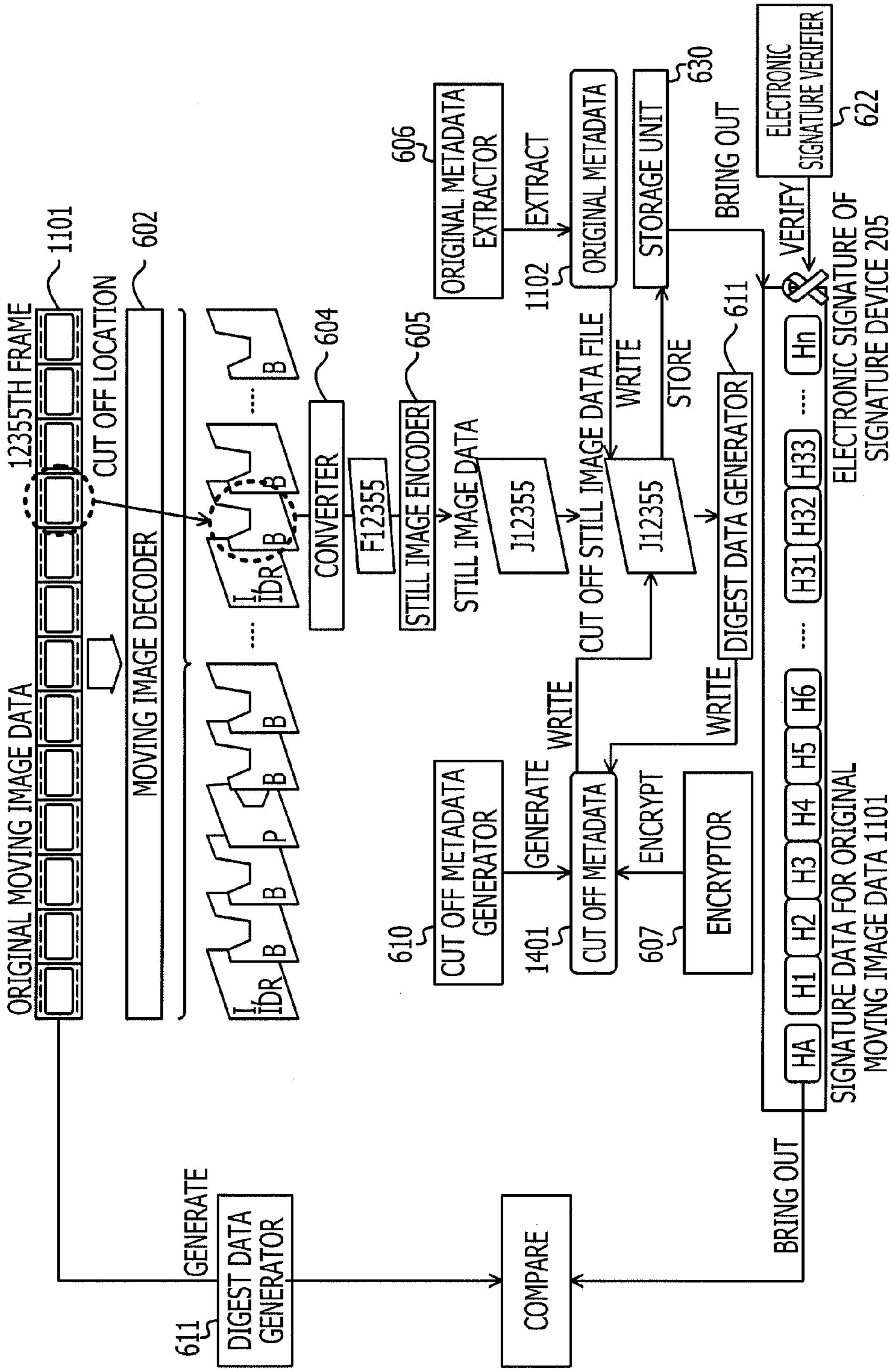

ORIGINAL MOVING IMAGE DATA
12355TH FRAME
1101
CUT OFF LOCATION
602
MOVING IMAGE DECODER
IDR
B
P
604
CONVERTER
F12355
605
STILL IMAGE ENCODER
STILL IMAGE DATA
J12355
CUT OFF STILL IMAGE DATA FILE
606
ORIGINAL METADATA EXTRACTOR
EXTRACT
1102
ORIGINAL METADATA
WRITE
STORE
630
STORAGE UNIT
BRING OUT
611
DIGEST DATA GENERATOR
610
CUT OFF METADATA GENERATOR
GENERATE
1401
CUT OFF METADATA
ENCRYPT
607
ENCRYPTOR
ELECTRONIC SIGNATURE VERIFIER
622
VERIFY
HA
H1
H2
H3
H4
H5
H6
H31
H32
H33
Hn
SIGNATURE DATA FOR ORIGINAL MOVING IMAGE DATA 1101
ELECTRONIC SIGNATURE OF SIGNATURE DEVICE 205
DIGEST DATA GENERATOR
COMPARE

FIG. 15A

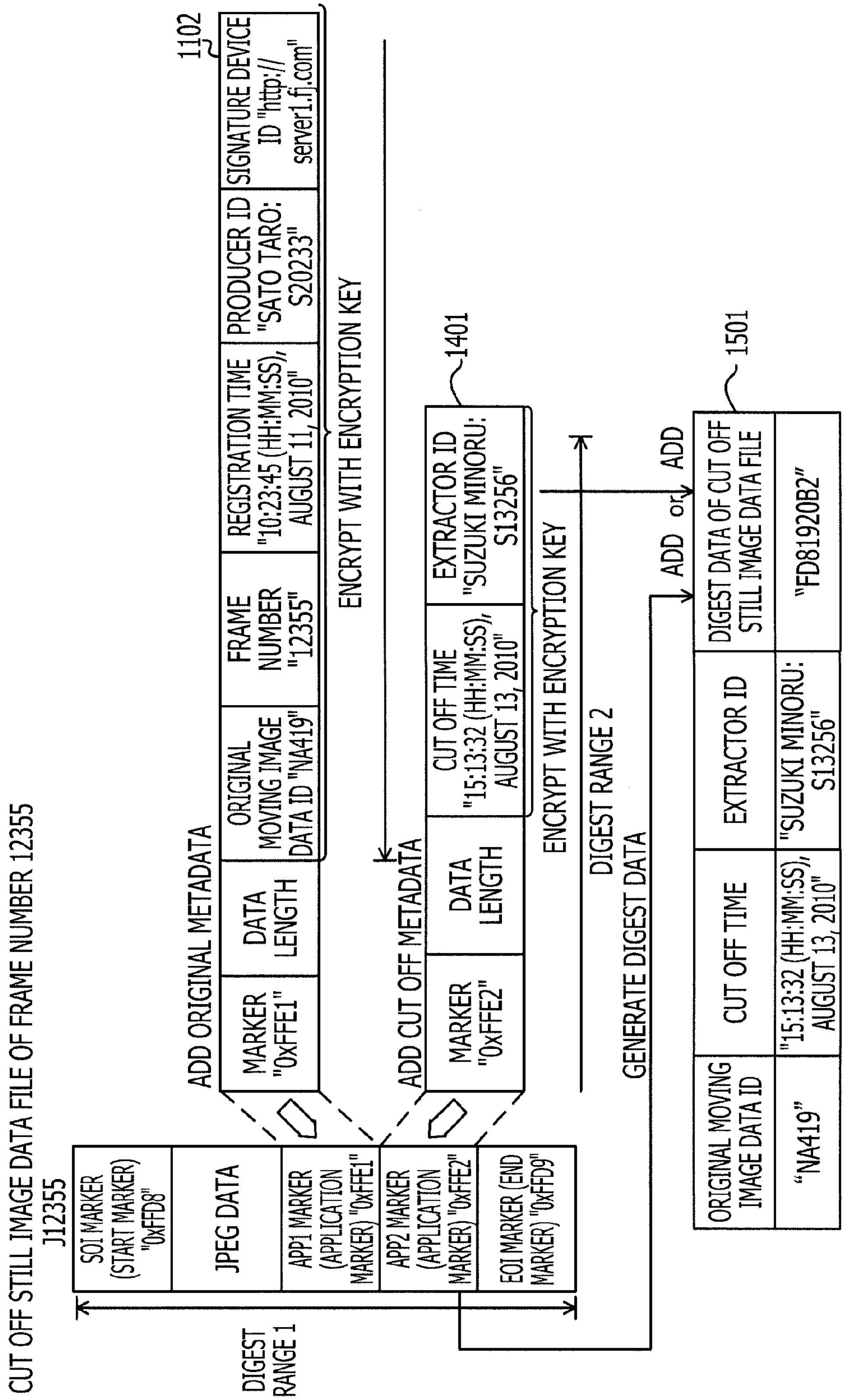

CUT OFF STILL IMAGE DATA FILE OF FRAME NUMBER 12355
J12355
SOI MARKER (START MARKER) "0xFFD8"
JPEG DATA
APP1 MARKER (APPLICATION MARKER) "0xFFE1"
APP2 MARKER (APPLICATION MARKER) "0xFFE2"
EOI MARKER (END MARKER) "0xFFD9"
DIGEST RANGE 1
ADD ORIGINAL METADATA
MARKER "0xFFE1"
DATA LENGTH
ORIGINAL MOVING IMAGE DATA ID "NA419"
FRAME NUMBER "12355"
REGISTRATION TIME "10:23:45 (HH:MM:SS), AUGUST 11, 2010"
PRODUCER ID "SATO TARO: S20233"
SIGNATURE DEVICE ID "http://server1.fj.com"
1102
ENCRYPT WITH ENCRYPTION KEY
ADD CUT OFF METADATA
MARKER "0xFFE2"
DATA LENGTH
CUT OFF TIME "15:13:32 (HH:MM:SS), AUGUST 13, 2010"
EXTRACTOR ID "SUZUKI MINORU: S13256"
1401
ENCRYPT WITH ENCRYPTION KEY
DIGEST RANGE 2
GENERATE DIGEST DATA
ADD or ADD
1501
ORIGINAL MOVING IMAGE DATA ID
CUT OFF TIME
EXTRACTOR ID
DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE
"NA419"
"15:13:32 (HH:MM:SS), AUGUST 13, 2010"
"SUZUKI MINORU: S13256"
"FD81920B2"

FIG. 15B

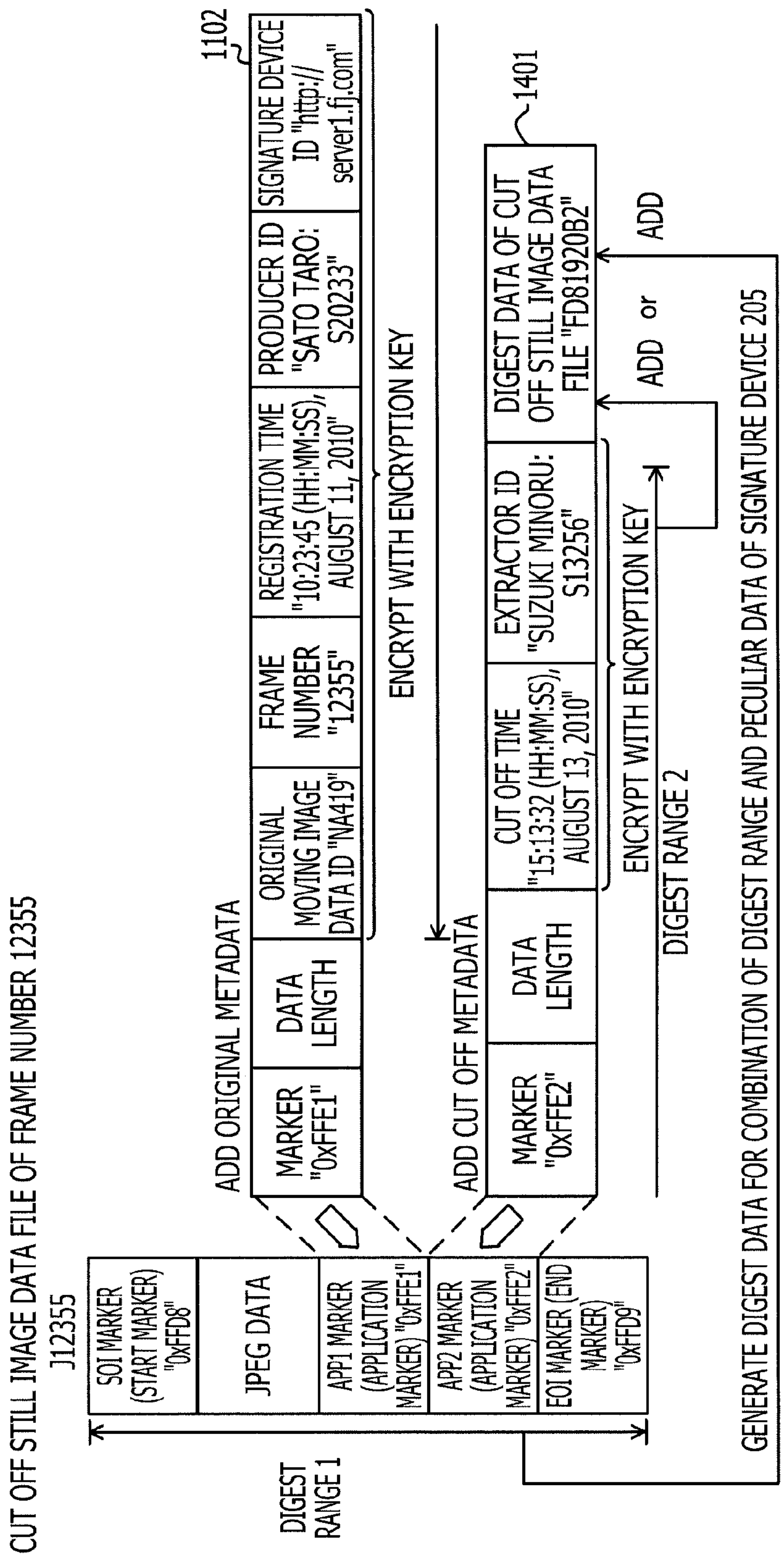
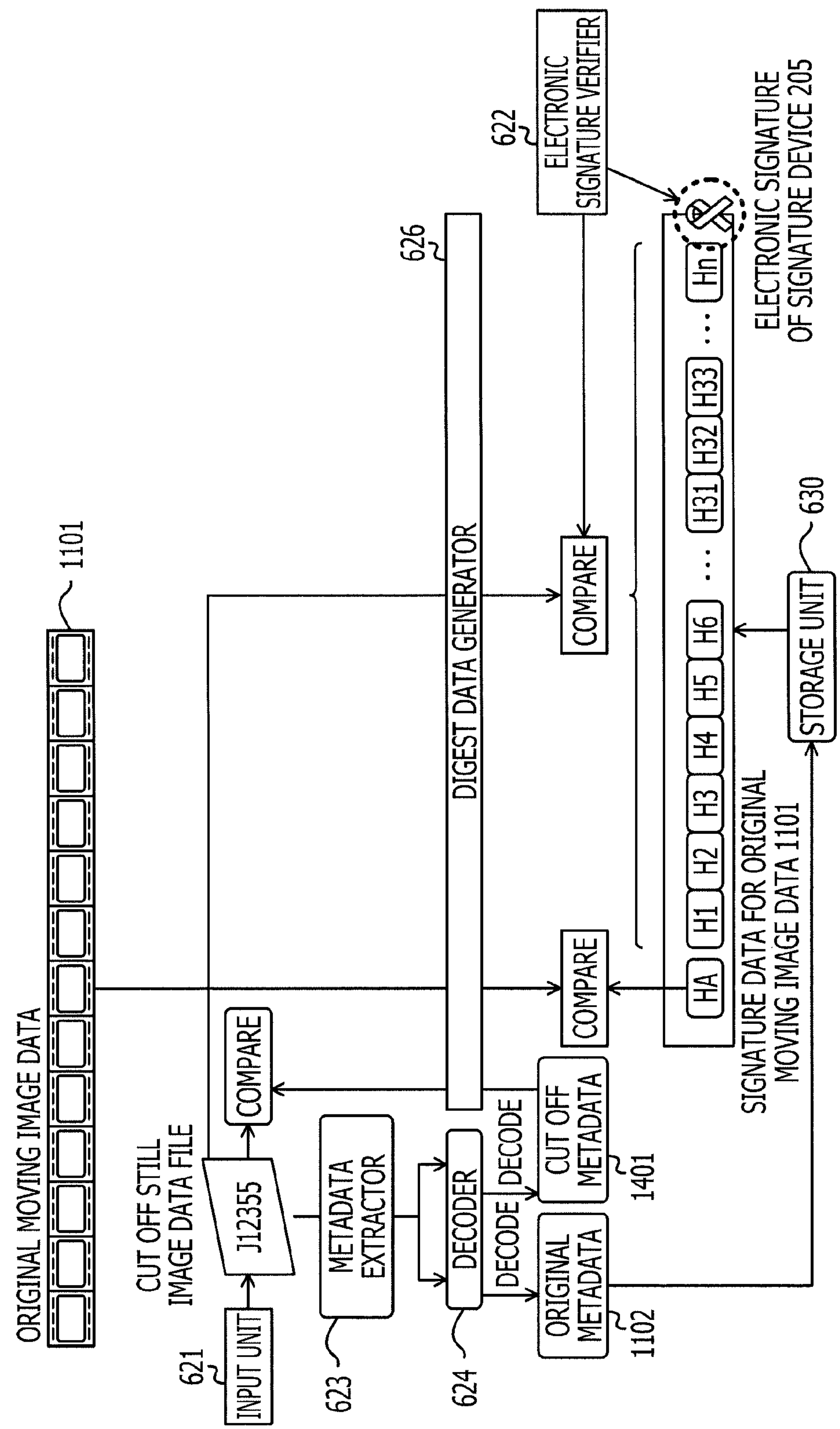

CUT OFF STILL IMAGE DATA FILE OF FRAME NUMBER 12355
J12355
SOI MARKER (START MARKER) "0xFFD8"
JPEG DATA
APP1 MARKER (APPLICATION MARKER) "0xFFE1"
APP2 MARKER (APPLICATION MARKER) "0xFFE2"
EOI MARKER (END MARKER) "0xFFD9"
DIGEST RANGE 1
ADD ORIGINAL METADATA
1102
MARKER "0xFFE1"
DATA LENGTH
ORIGINAL MOVING IMAGE DATA ID "NA419"
FRAME NUMBER "12355"
REGISTRATION TIME "10:23:45 (HH:MM:SS), AUGUST 11, 2010"
PRODUCER ID "SATO TARO: S20233"
SIGNATURE DEVICE ID "http://server1.fj.com"
ENCRYPT WITH ENCRYPTION KEY
ADD CUT OFF METADATA
1401
MARKER "0xFFE2"
DATA LENGTH
CUT OFF TIME "15:13:32 (HH:MM:SS), AUGUST 13, 2010"
EXTRACTOR ID "SUZUKI MINORU: S13256"
DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE "FD81920B2"
ENCRYPT WITH ENCRYPTION KEY
DIGEST RANGE 2
ADD or ADD
GENERATE DIGEST DATA FOR COMBINATION OF DIGEST RANGE AND PECULIAR DATA OF SIGNATURE DEVICE 205

FIG. 16



ORIGINAL MOVING IMAGE DATA
1101
621
INPUT UNIT
CUT OFF STILL IMAGE DATA FILE
J12355
COMPARE
623
METADATA EXTRACTOR
624
DECODER
DECODE
DECODE
ORIGINAL METADATA
1102
CUT OFF METADATA
1401
626
DIGEST DATA GENERATOR
COMPARE
COMPARE
622
ELECTRONIC SIGNATURE VERIFIER
HA
H1
H2
H3
H4
H5
H6
H31
H32
H33
Hn
SIGNATURE DATA FOR ORIGINAL MOVING IMAGE DATA 1101
ELECTRONIC SIGNATURE OF SIGNATURE DEVICE 205
STORAGE UNIT
630

FIG. 17

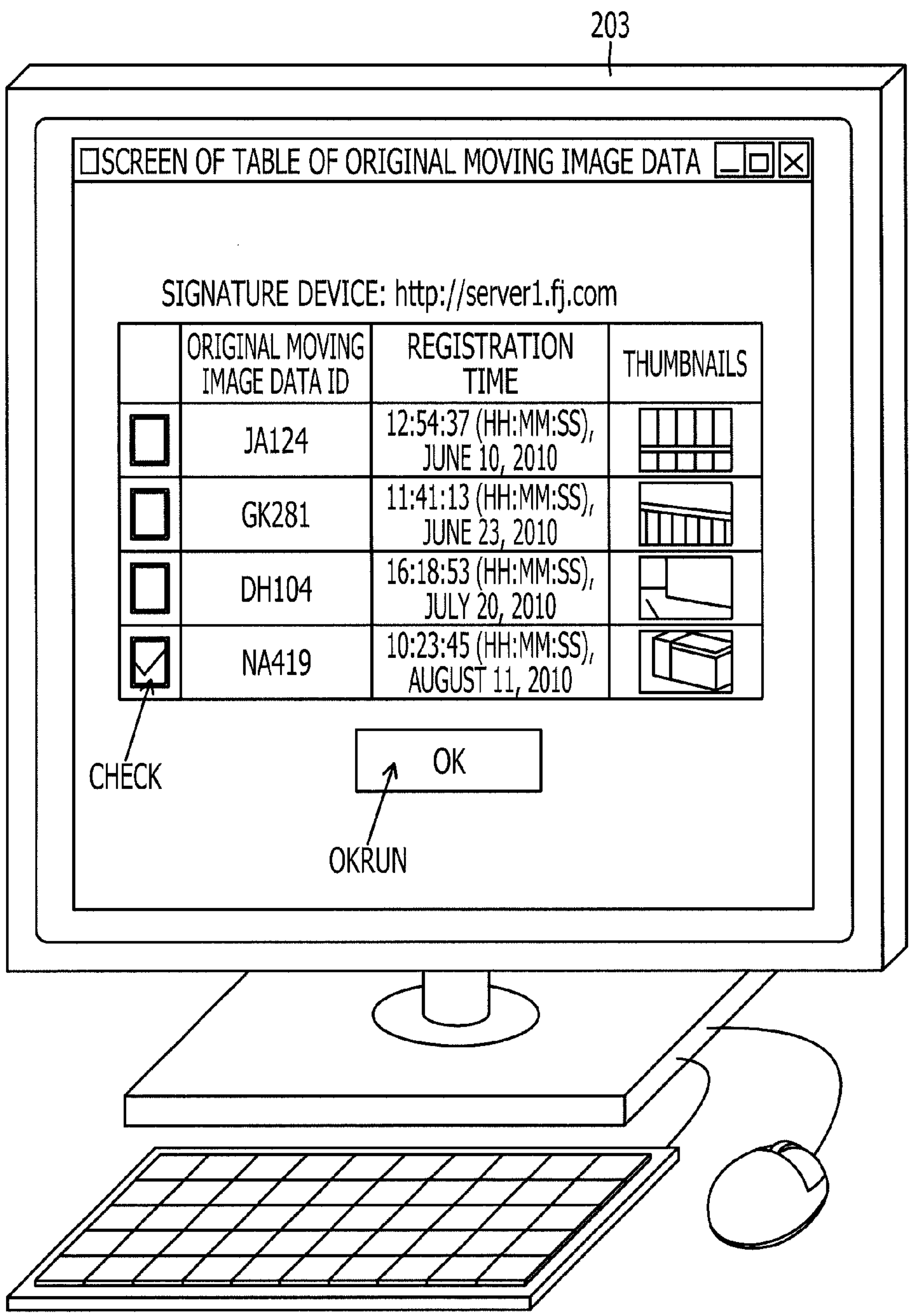

203
SCREEN OF TABLE OF ORIGINAL MOVING IMAGE DATA
SIGNATURE DEVICE: http://server1.fj.com
ORIGINAL MOVING IMAGE DATA ID
REGISTRATION TIME
THUMBNAILS
JA124
12:54:37 (HH:MM:SS), JUNE 10, 2010
GK281
11:41:13 (HH:MM:SS), JUNE 23, 2010
DH104
16:18:53 (HH:MM:SS), JULY 20, 2010
NA419
10:23:45 (HH:MM:SS), AUGUST 11, 2010
CHECK
OK
OKRUN

FIG. 18

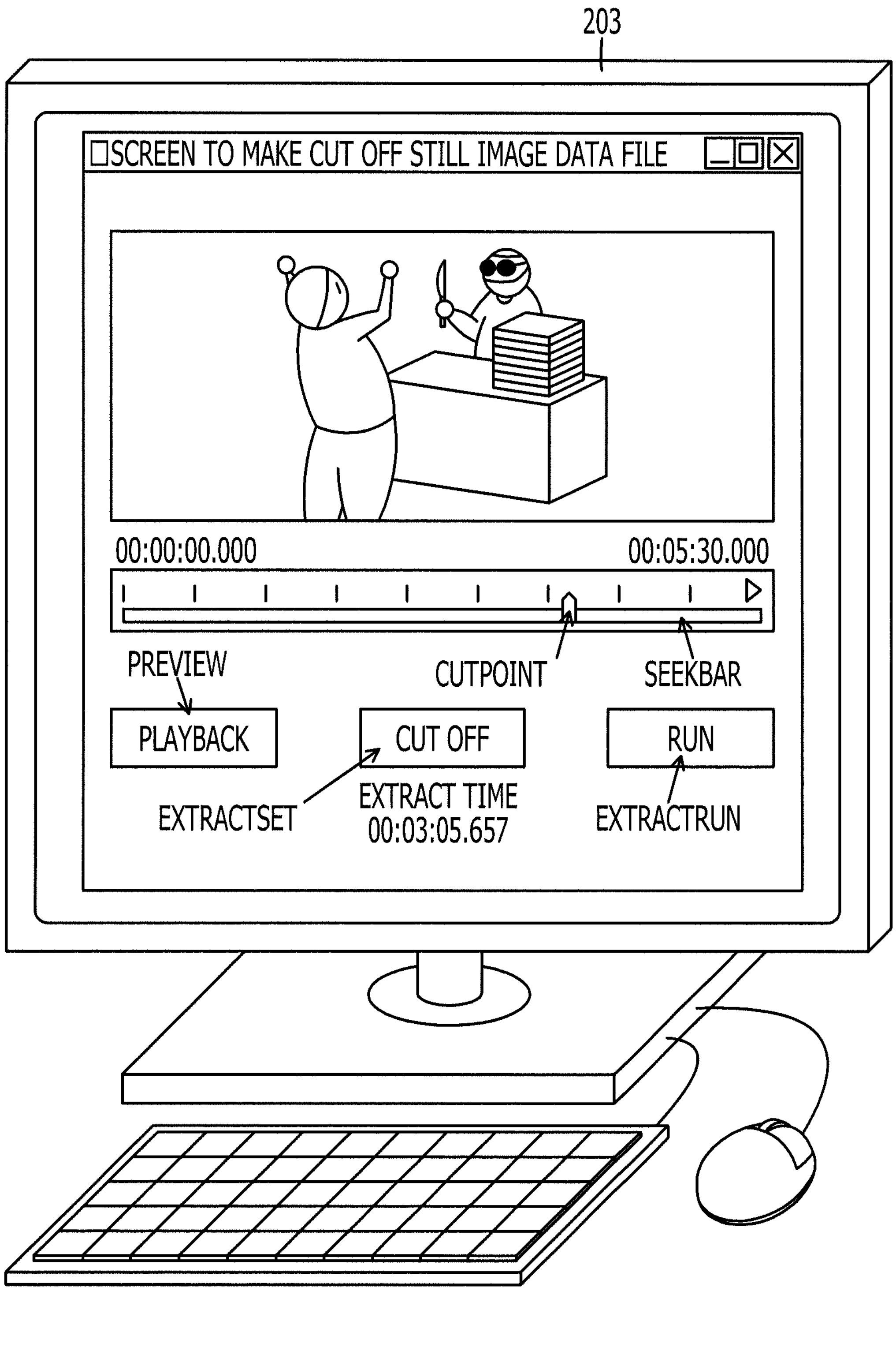

203
SCREEN TO MAKE CUT OFF STILL IMAGE DATA FILE
00:00:00.000
00:05:30.000
PREVIEW
CUTPOINT
SEEKBAR
PLAYBACK
CUT OFF
RUN
EXTRACTSET
EXTRACT TIME
00:03:05.657
EXTRACTRUN

FIG. 19

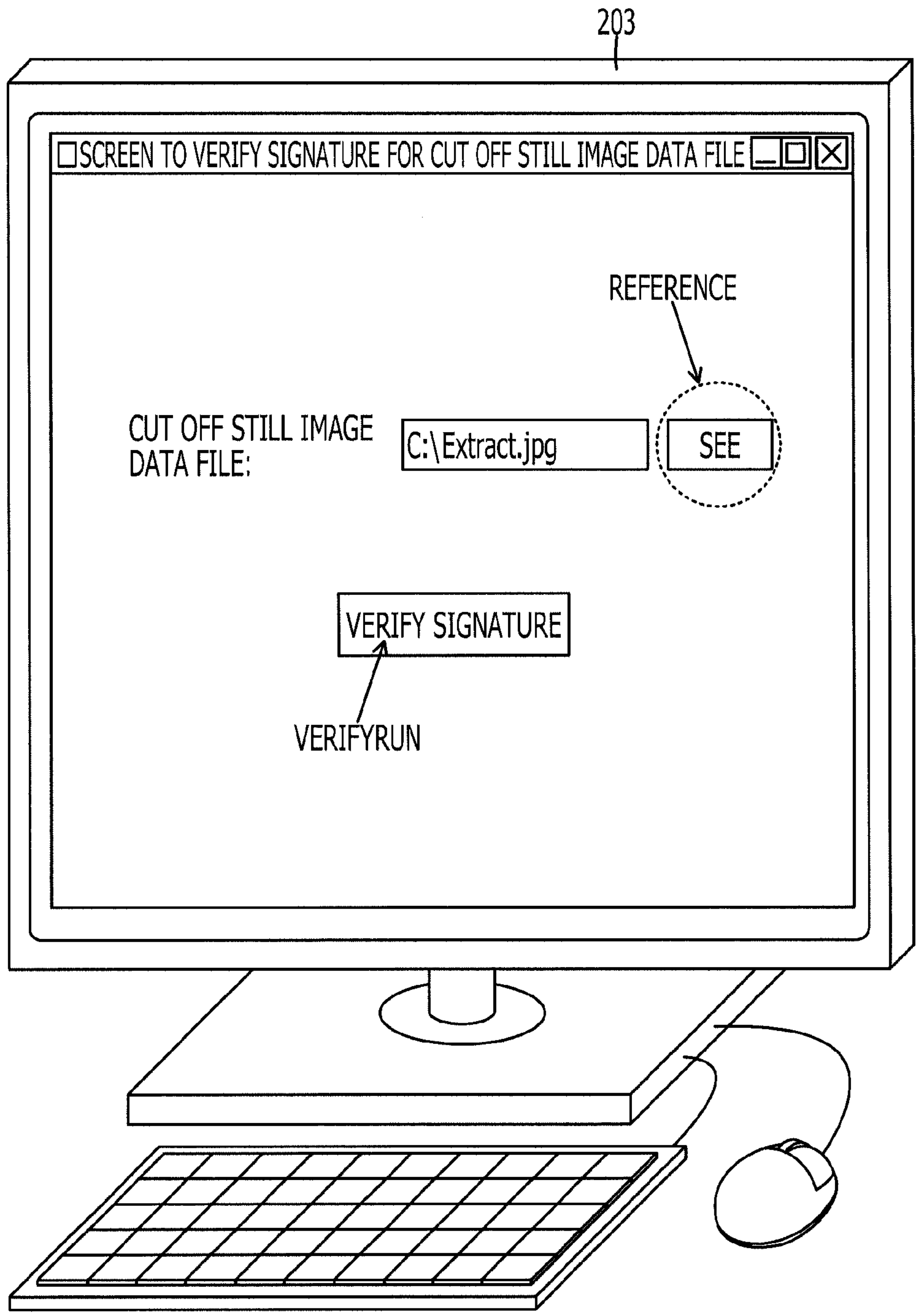

203
SCREEN TO VERIFY SIGNATURE FOR CUT OFF STILL IMAGE DATA FILE
REFERENCE
CUT OFF STILL IMAGE
DATA FILE:
C:\Extract.jpg
SEE
VERIFY SIGNATURE
VERIFYRUN

FIG. 20

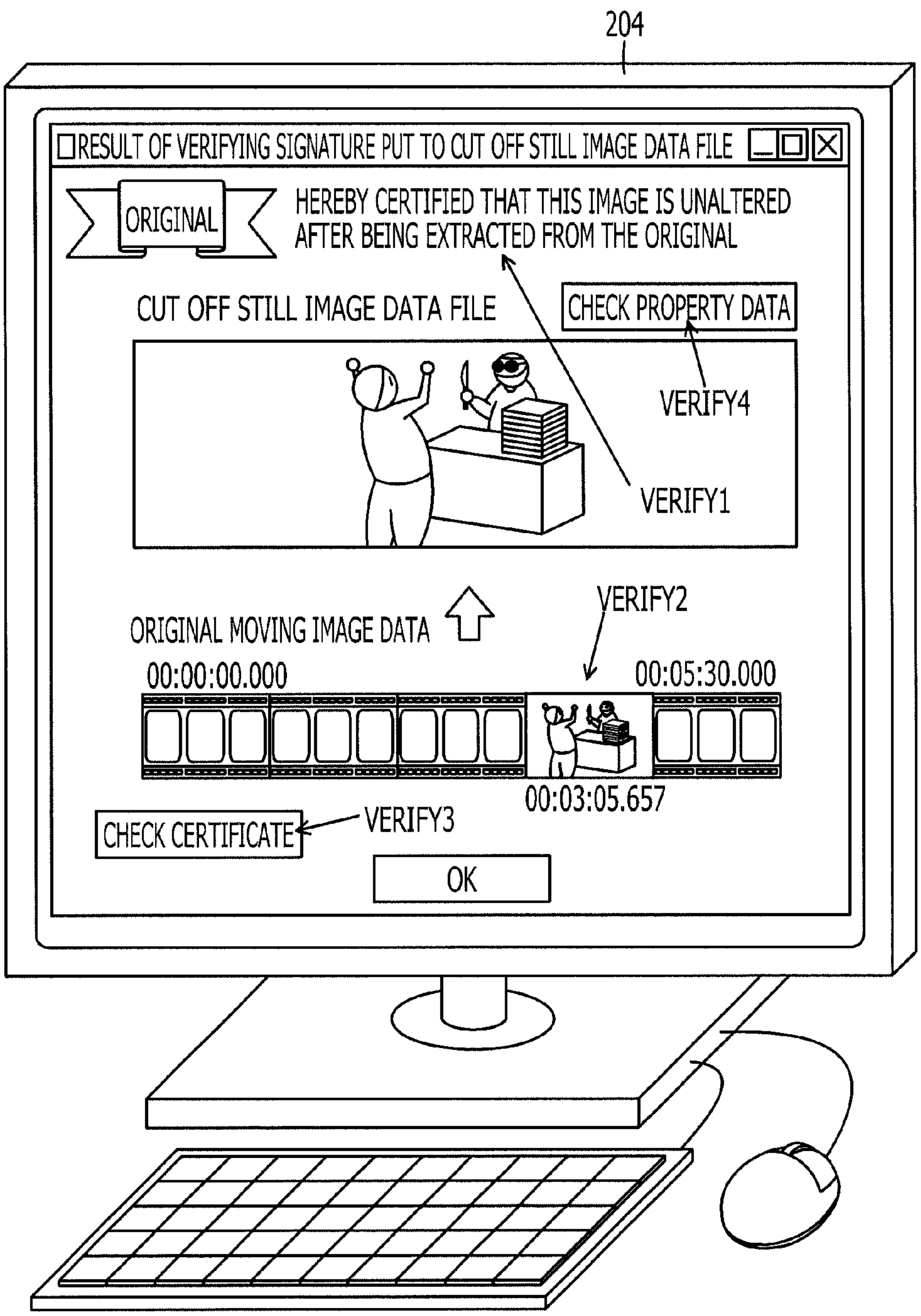

204
RESULT OF VERIFYING SIGNATURE PUT TO CUT OFF STILL IMAGE DATA FILE
ORIGINAL
HEREBY CERTIFIED THAT THIS IMAGE IS UNALTERED
AFTER BEING EXTRACTED FROM THE ORIGINAL
CUT OFF STILL IMAGE DATA FILE
CHECK PROPERTY DATA
VERIFY4
VERIFY1
VERIFY2
ORIGINAL MOVING IMAGE DATA
00:00:00.000
00:05:30.000
00:03:05.657
CHECK CERTIFICATE
VERIFY3
OK

FIG. 21

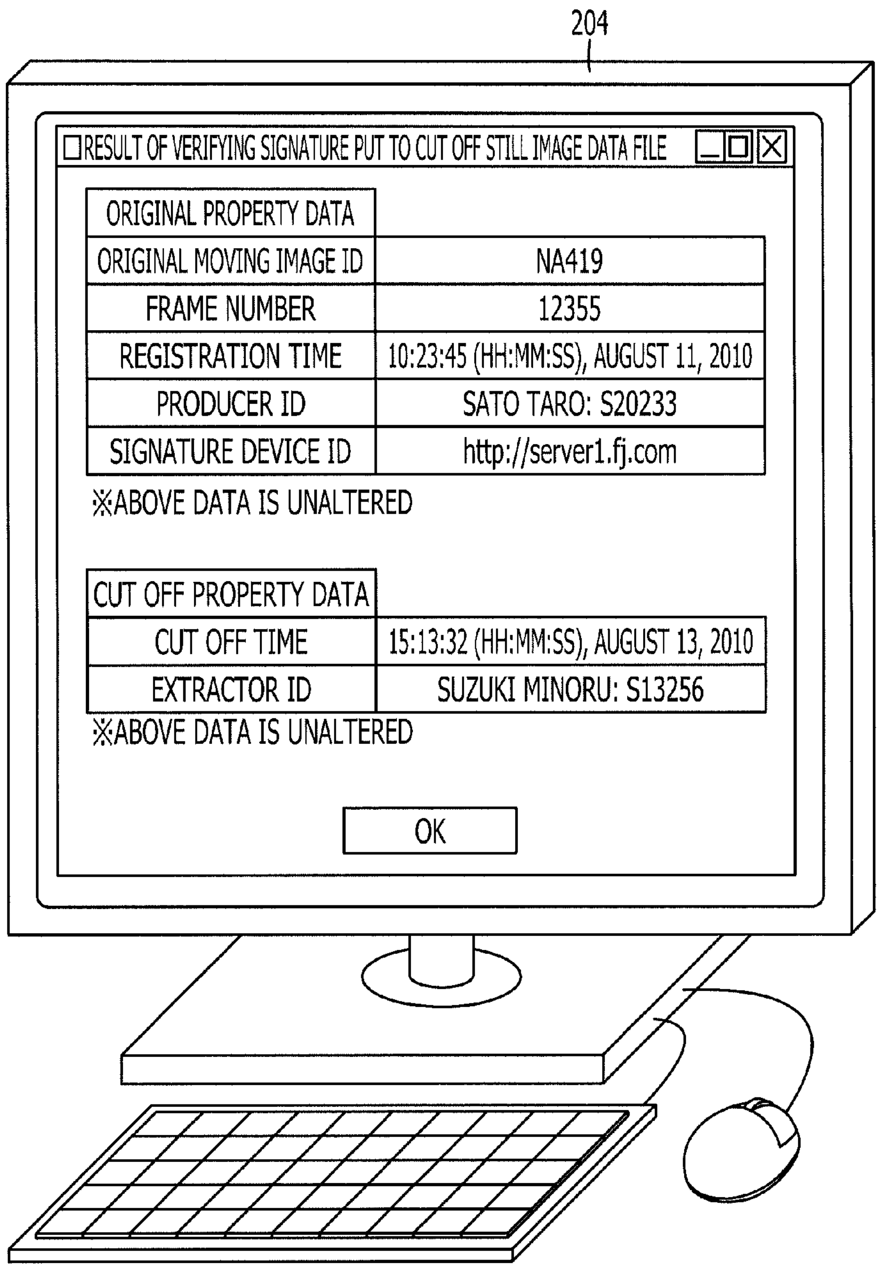

204
☐RESULT OF VERIFYING SIGNATURE PUT TO CUT OFF STILL IMAGE DATA FILE
ORIGINAL PROPERTY DATA
ORIGINAL MOVING IMAGE ID
NA419
FRAME NUMBER
12355
REGISTRATION TIME
10:23:45 (HH:MM:SS), AUGUST 11, 2010
PRODUCER ID
SATO TARO: S20233
SIGNATURE DEVICE ID
http://server1.fj.com
※ABOVE DATA IS UNALTERED
CUT OFF PROPERTY DATA
CUT OFF TIME
15:13:32 (HH:MM:SS), AUGUST 13, 2010
EXTRACTOR ID
SUZUKI MINORU: S13256
※ABOVE DATA IS UNALTERED
OK

FIG. 22

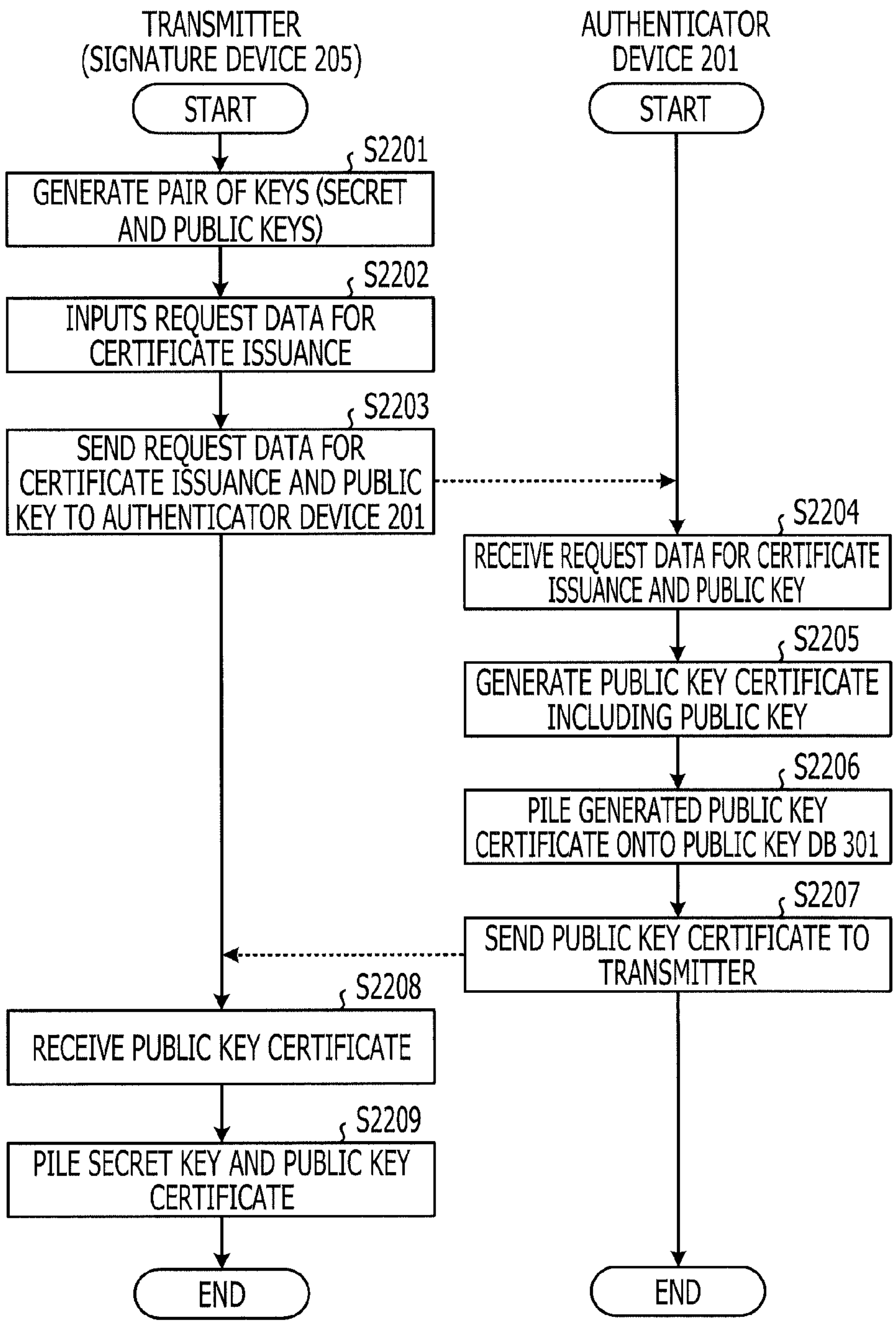
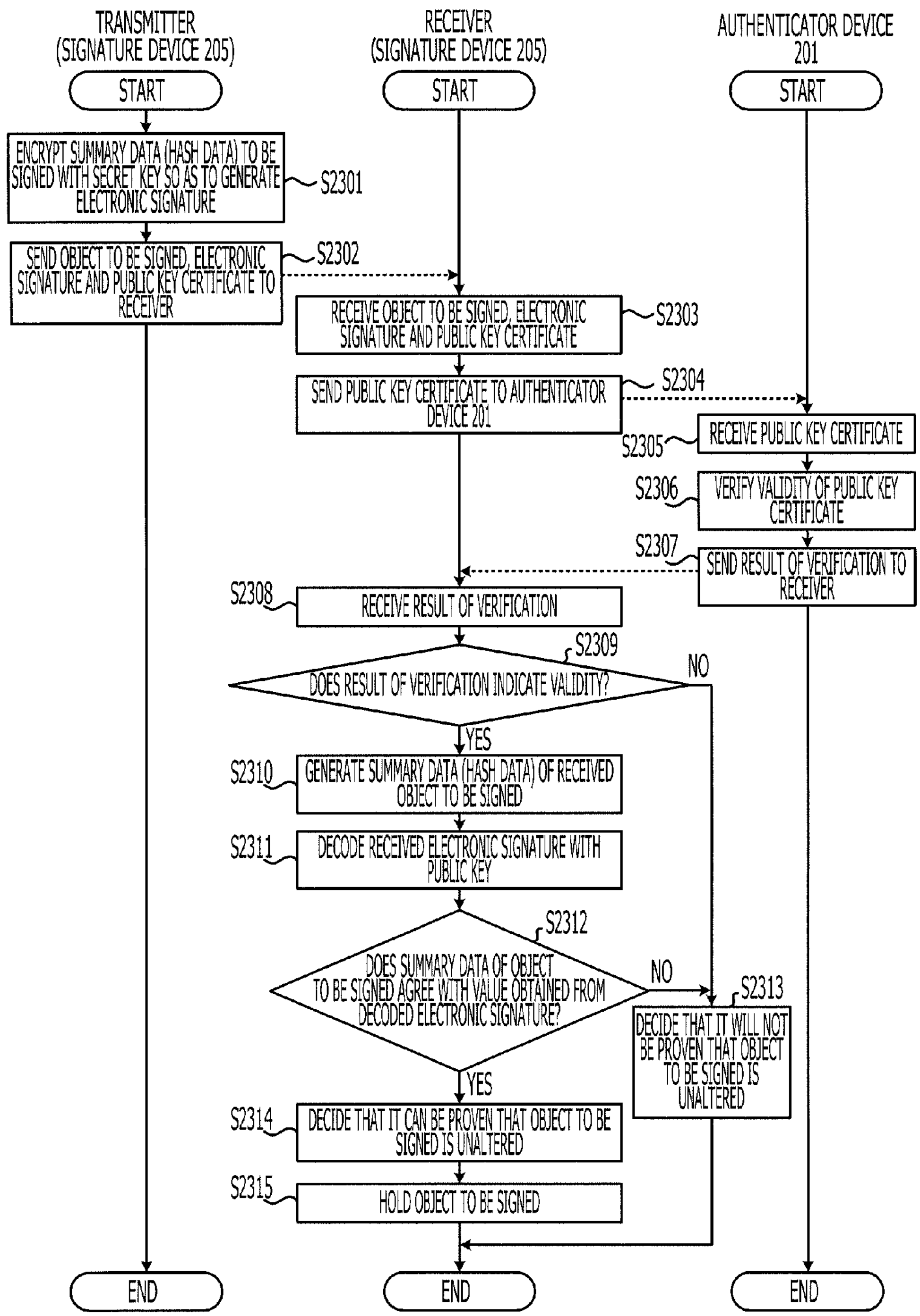

TRANSMITTER
(SIGNATURE DEVICE 205)
AUTHENTICATOR
DEVICE 201
START
START
S2201
GENERATE PAIR OF KEYS (SECRET AND PUBLIC KEYS)
S2202
INPUTS REQUEST DATA FOR CERTIFICATE ISSUANCE
S2203
SEND REQUEST DATA FOR CERTIFICATE ISSUANCE AND PUBLIC KEY TO AUTHENTICATOR DEVICE 201
S2204
RECEIVE REQUEST DATA FOR CERTIFICATE ISSUANCE AND PUBLIC KEY
S2205
GENERATE PUBLIC KEY CERTIFICATE INCLUDING PUBLIC KEY
S2206
PILE GENERATED PUBLIC KEY CERTIFICATE ONTO PUBLIC KEY DB 301
S2207
SEND PUBLIC KEY CERTIFICATE TO TRANSMITTER
S2208
RECEIVE PUBLIC KEY CERTIFICATE
S2209
PILE SECRET KEY AND PUBLIC KEY CERTIFICATE
END
END

FIG. 23



TRANSMITTER (SIGNATURE DEVICE 205)
RECEIVER (SIGNATURE DEVICE 205)
AUTHENTICATOR DEVICE 201
START
START
START
ENCRYPT SUMMARY DATA (HASH DATA) TO BE SIGNED WITH SECRET KEY SO AS TO GENERATE ELECTRONIC SIGNATURE
S2301
SEND OBJECT TO BE SIGNED, ELECTRONIC SIGNATURE AND PUBLIC KEY CERTIFICATE TO RECEIVER
S2302
RECEIVE OBJECT TO BE SIGNED, ELECTRONIC SIGNATURE AND PUBLIC KEY CERTIFICATE
S2303
SEND PUBLIC KEY CERTIFICATE TO AUTHENTICATOR DEVICE 201
S2304
RECEIVE PUBLIC KEY CERTIFICATE
S2305
VERIFY VALIDITY OF PUBLIC KEY CERTIFICATE
S2306
SEND RESULT OF VERIFICATION TO RECEIVER
S2307
RECEIVE RESULT OF VERIFICATION
S2308
DOES RESULT OF VERIFICATION INDICATE VALIDITY?
S2309
NO
YES
GENERATE SUMMARY DATA (HASH DATA) OF RECEIVED OBJECT TO BE SIGNED
S2310
DECODE RECEIVED ELECTRONIC SIGNATURE WITH PUBLIC KEY
S2311
DOES SUMMARY DATA OF OBJECT TO BE SIGNED AGREE WITH VALUE OBTAINED FROM DECODED ELECTRONIC SIGNATURE?
S2312
NO
S2313
DECIDE THAT IT WILL NOT BE PROVEN THAT OBJECT TO BE SIGNED IS UNALTERED
YES
DECIDE THAT IT CAN BE PROVEN THAT OBJECT TO BE SIGNED IS UNALTERED
S2314
HOLD OBJECT TO BE SIGNED
S2315
END
END
END

FIG. 24

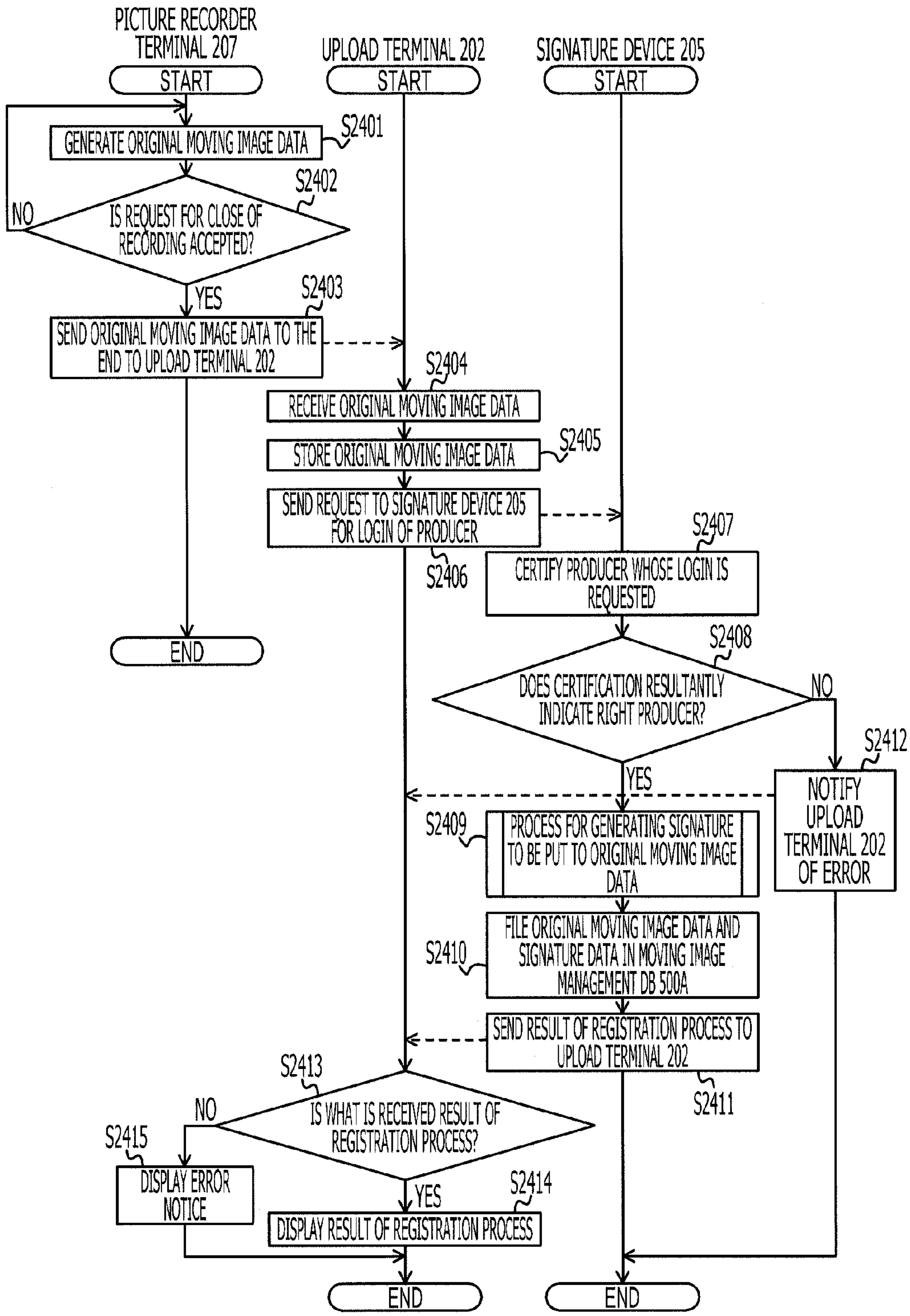

PICTURE RECORDER TERMINAL 207
UPLOAD TERMINAL 202
SIGNATURE DEVICE 205
START
START
START
GENERATE ORIGINAL MOVING IMAGE DATA
S2401
S2402
IS REQUEST FOR CLOSE OF RECORDING ACCEPTED?
NO
YES
S2403
SEND ORIGINAL MOVING IMAGE DATA TO THE END TO UPLOAD TERMINAL 202
S2404
RECEIVE ORIGINAL MOVING IMAGE DATA
STORE ORIGINAL MOVING IMAGE DATA
S2405
SEND REQUEST TO SIGNATURE DEVICE 205 FOR LOGIN OF PRODUCER
S2406
S2407
CERTIFY PRODUCER WHOSE LOGIN IS REQUESTED
END
S2408
DOES CERTIFICATION RESULTANTLY INDICATE RIGHT PRODUCER?
NO
YES
S2412
NOTIFY UPLOAD TERMINAL 202 OF ERROR
S2409
PROCESS FOR GENERATING SIGNATURE TO BE PUT TO ORIGINAL MOVING IMAGE DATA
S2410
FILE ORIGINAL MOVING IMAGE DATA AND SIGNATURE DATA IN MOVING IMAGE MANAGEMENT DB 500A
SEND RESULT OF REGISTRATION PROCESS TO UPLOAD TERMINAL 202
S2411
S2413
IS WHAT IS RECEIVED RESULT OF REGISTRATION PROCESS?
NO
S2415
DISPLAY ERROR NOTICE
YES
S2414
DISPLAY RESULT OF REGISTRATION PROCESS
END
END

FIG. 25A

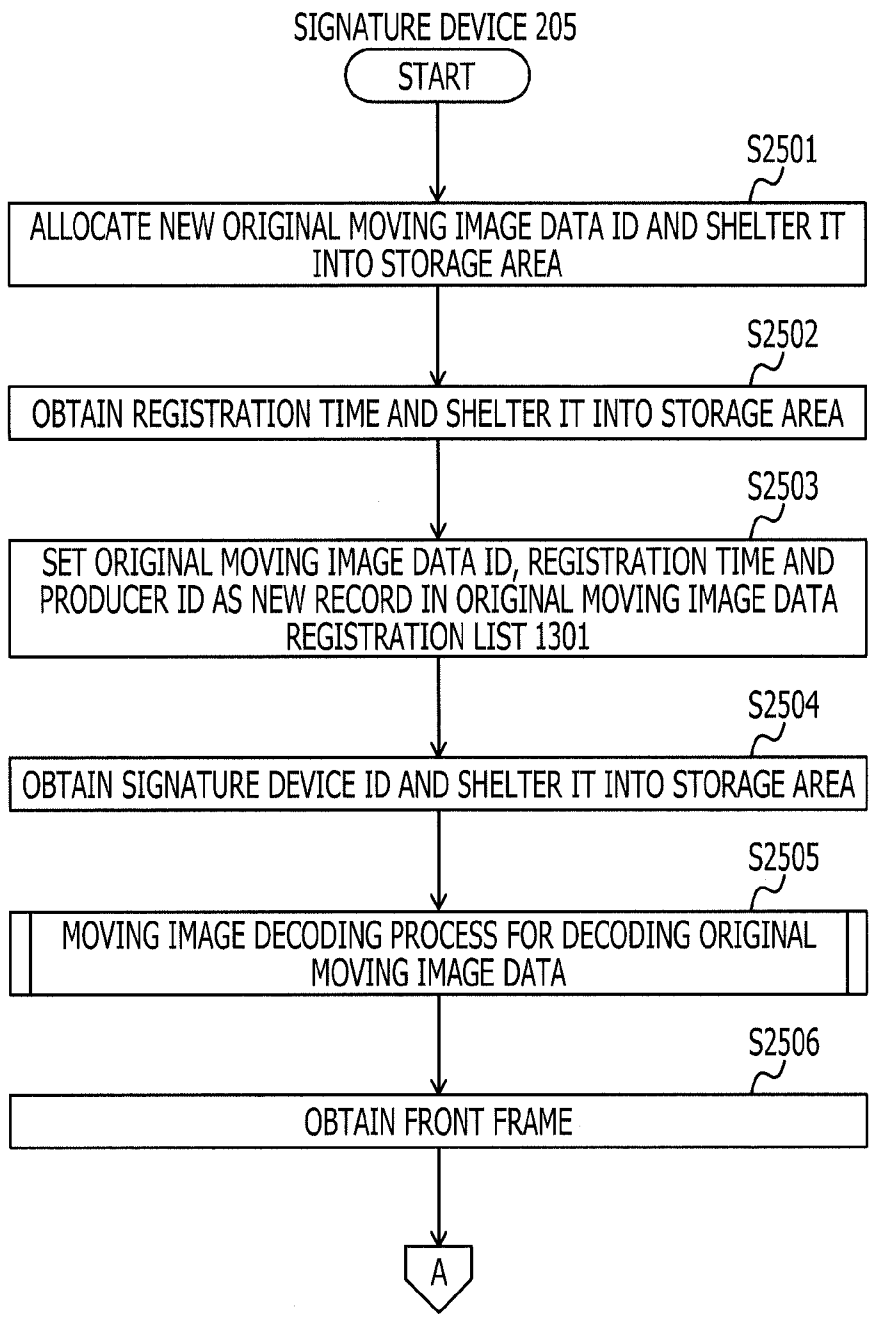

SIGNATURE DEVICE 205
START
S2501
ALLOCATE NEW ORIGINAL MOVING IMAGE DATA ID AND SHELTER IT INTO STORAGE AREA
S2502
OBTAIN REGISTRATION TIME AND SHELTER IT INTO STORAGE AREA
S2503
SET ORIGINAL MOVING IMAGE DATA ID, REGISTRATION TIME AND PRODUCER ID AS NEW RECORD IN ORIGINAL MOVING IMAGE DATA REGISTRATION LIST 1301
S2504
OBTAIN SIGNATURE DEVICE ID AND SHELTER IT INTO STORAGE AREA
S2505
MOVING IMAGE DECODING PROCESS FOR DECODING ORIGINAL MOVING IMAGE DATA
S2506
OBTAIN FRONT FRAME
A

FIG. 25B

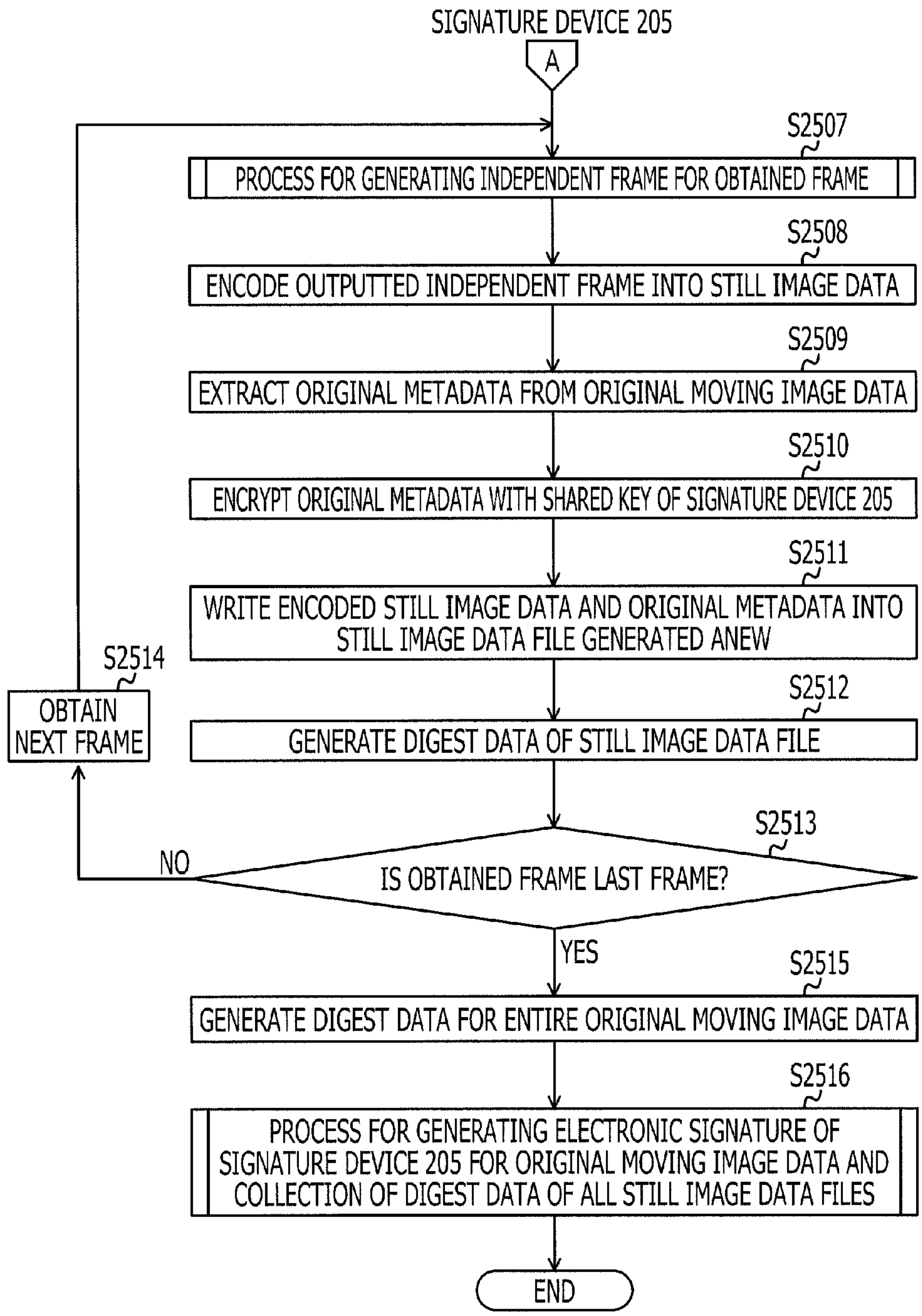

SIGNATURE DEVICE 205
A
S2507
PROCESS FOR GENERATING INDEPENDENT FRAME FOR OBTAINED FRAME
S2508
ENCODE OUTPUTTED INDEPENDENT FRAME INTO STILL IMAGE DATA
S2509
EXTRACT ORIGINAL METADATA FROM ORIGINAL MOVING IMAGE DATA
S2510
ENCRYPT ORIGINAL METADATA WITH SHARED KEY OF SIGNATURE DEVICE 205
S2511
WRITE ENCODED STILL IMAGE DATA AND ORIGINAL METADATA INTO STILL IMAGE DATA FILE GENERATED ANEW
S2514
OBTAIN NEXT FRAME
S2512
GENERATE DIGEST DATA OF STILL IMAGE DATA FILE
S2513
IS OBTAINED FRAME LAST FRAME?
NO
YES
S2515
GENERATE DIGEST DATA FOR ENTIRE ORIGINAL MOVING IMAGE DATA
S2516
PROCESS FOR GENERATING ELECTRONIC SIGNATURE OF SIGNATURE DEVICE 205 FOR ORIGINAL MOVING IMAGE DATA AND COLLECTION OF DIGEST DATA OF ALL STILL IMAGE DATA FILES
END

FIG. 26

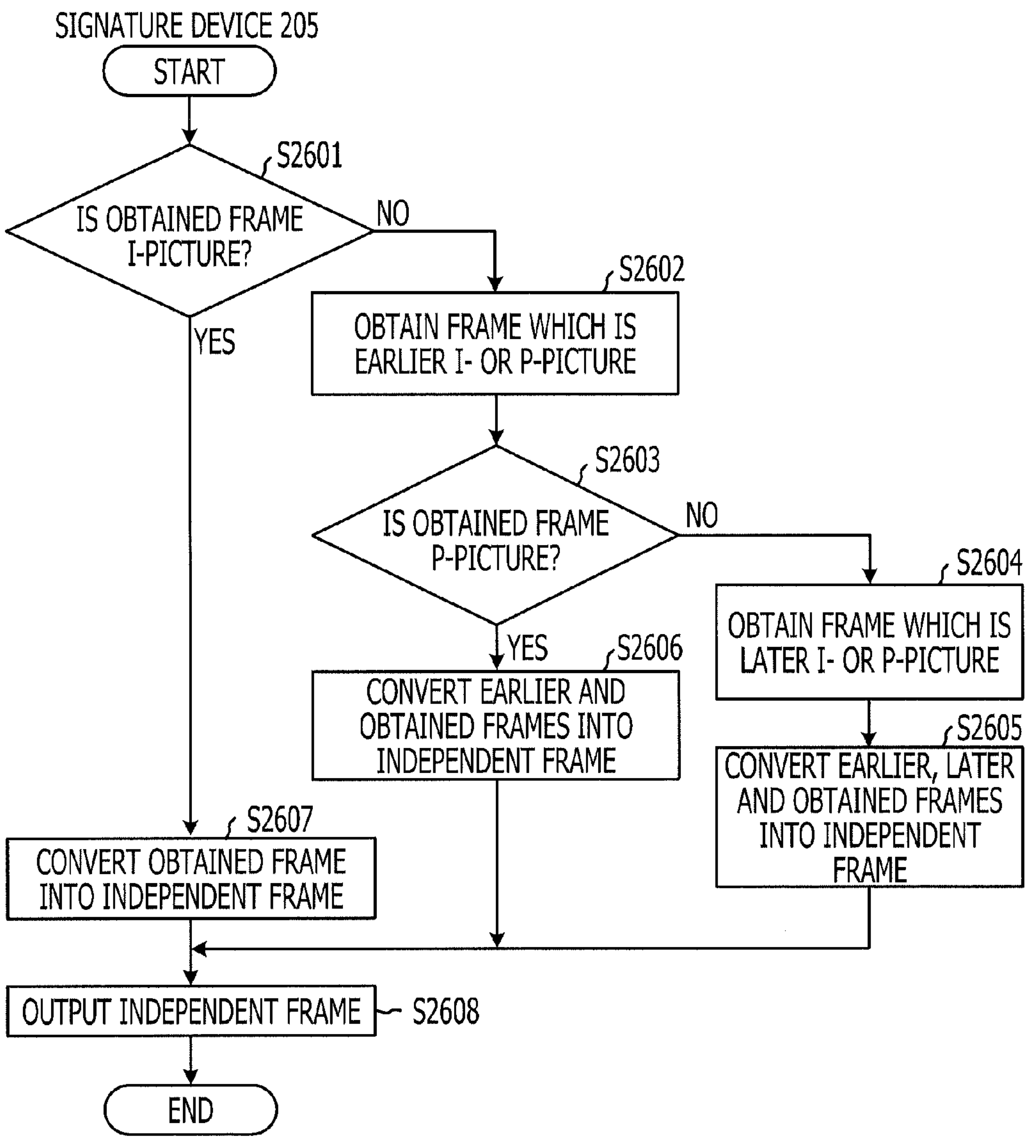

SIGNATURE DEVICE 205
START
S2601
IS OBTAINED FRAME I-PICTURE?
NO
YES
S2602
OBTAIN FRAME WHICH IS EARLIER I- OR P-PICTURE
S2603
IS OBTAINED FRAME P-PICTURE?
NO
YES
S2604
OBTAIN FRAME WHICH IS LATER I- OR P-PICTURE
S2606
CONVERT EARLIER AND OBTAINED FRAMES INTO INDEPENDENT FRAME
S2605
CONVERT EARLIER, LATER AND OBTAINED FRAMES INTO INDEPENDENT FRAME
S2607
CONVERT OBTAINED FRAME INTO INDEPENDENT FRAME
OUTPUT INDEPENDENT FRAME
S2608
END

FIG. 27A

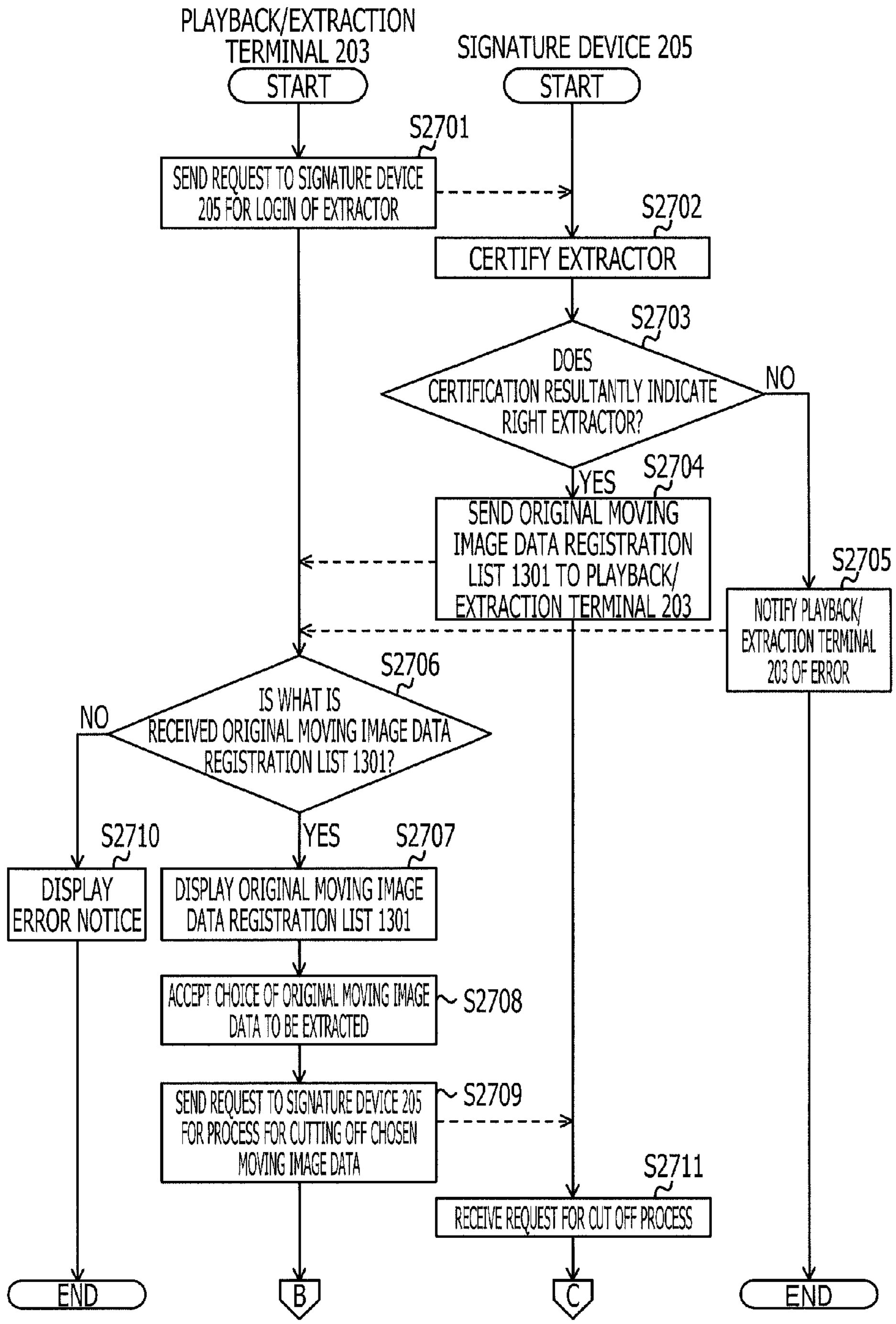

PLAYBACK/EXTRACTION TERMINAL 203
SIGNATURE DEVICE 205
START
START
S2701
SEND REQUEST TO SIGNATURE DEVICE 205 FOR LOGIN OF EXTRACTOR
S2702
CERTIFY EXTRACTOR
S2703
DOES CERTIFICATION RESULTANTLY INDICATE RIGHT EXTRACTOR?
NO
YES
S2704
SEND ORIGINAL MOVING IMAGE DATA REGISTRATION LIST 1301 TO PLAYBACK/ EXTRACTION TERMINAL 203
S2705
NOTIFY PLAYBACK/ EXTRACTION TERMINAL 203 OF ERROR
S2706
IS WHAT IS RECEIVED ORIGINAL MOVING IMAGE DATA REGISTRATION LIST 1301?
NO
YES
S2710
DISPLAY ERROR NOTICE
S2707
DISPLAY ORIGINAL MOVING IMAGE DATA REGISTRATION LIST 1301
ACCEPT CHOICE OF ORIGINAL MOVING IMAGE DATA TO BE EXTRACTED
S2708
SEND REQUEST TO SIGNATURE DEVICE 205 FOR PROCESS FOR CUTTING OFF CHOSEN MOVING IMAGE DATA
S2709
S2711
RECEIVE REQUEST FOR CUT OFF PROCESS
END
B
C
END

FIG. 27B

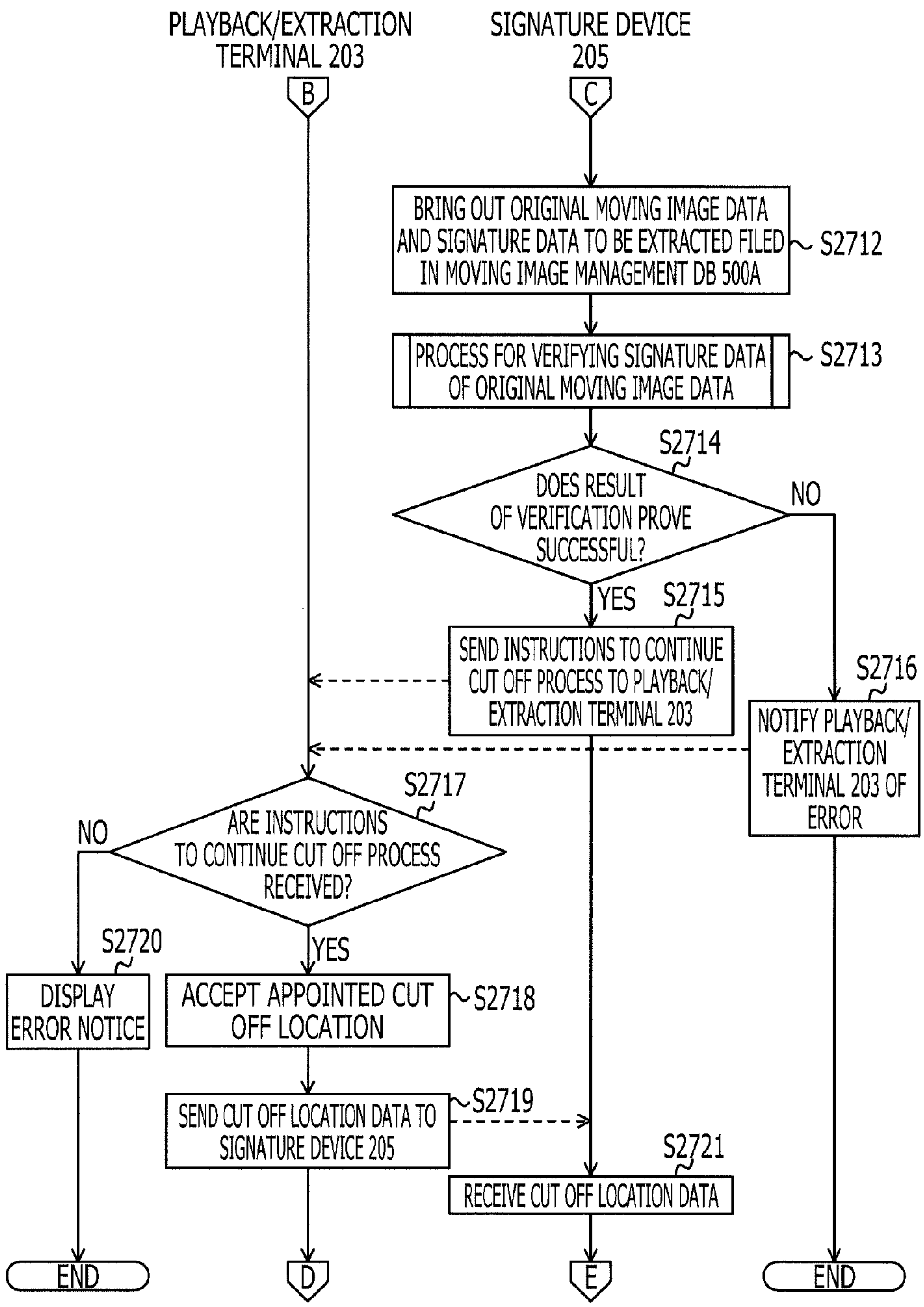

PLAYBACK/EXTRACTION TERMINAL 203
SIGNATURE DEVICE 205
B
C
BRING OUT ORIGINAL MOVING IMAGE DATA AND SIGNATURE DATA TO BE EXTRACTED FILED IN MOVING IMAGE MANAGEMENT DB 500A
S2712
PROCESS FOR VERIFYING SIGNATURE DATA OF ORIGINAL MOVING IMAGE DATA
S2713
S2714
DOES RESULT OF VERIFICATION PROVE SUCCESSFUL?
NO
YES
S2715
SEND INSTRUCTIONS TO CONTINUE CUT OFF PROCESS TO PLAYBACK/ EXTRACTION TERMINAL 203
S2716
NOTIFY PLAYBACK/ EXTRACTION TERMINAL 203 OF ERROR
S2717
ARE INSTRUCTIONS TO CONTINUE CUT OFF PROCESS RECEIVED?
NO
YES
S2720
DISPLAY ERROR NOTICE
ACCEPT APPOINTED CUT OFF LOCATION
S2718
SEND CUT OFF LOCATION DATA TO SIGNATURE DEVICE 205
S2719
S2721
RECEIVE CUT OFF LOCATION DATA
END
D
E
END

FIG. 27C

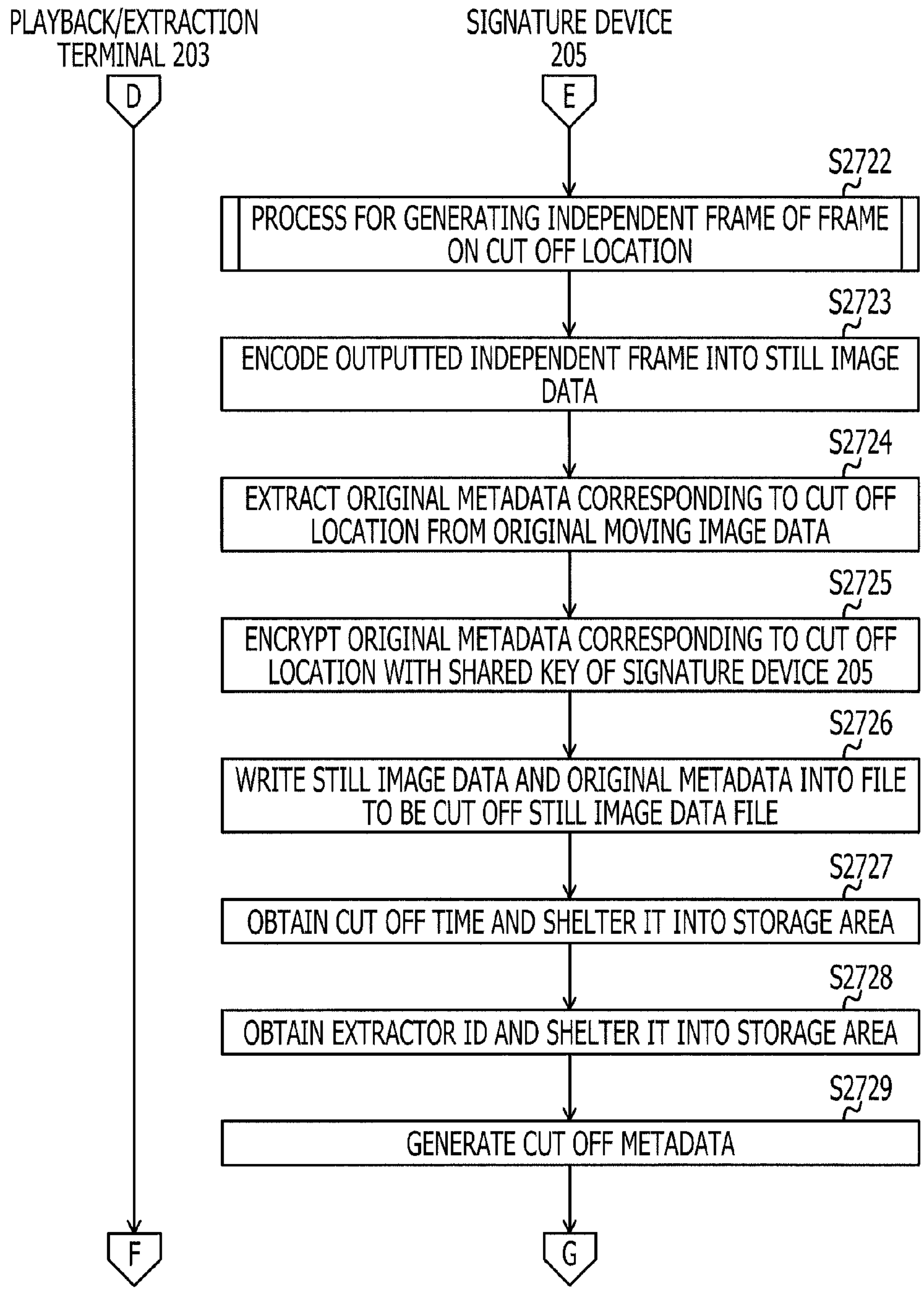

PLAYBACK/EXTRACTION TERMINAL 203
SIGNATURE DEVICE 205
D
E
S2722
PROCESS FOR GENERATING INDEPENDENT FRAME OF FRAME ON CUT OFF LOCATION
S2723
ENCODE OUTPUTTED INDEPENDENT FRAME INTO STILL IMAGE DATA
S2724
EXTRACT ORIGINAL METADATA CORRESPONDING TO CUT OFF LOCATION FROM ORIGINAL MOVING IMAGE DATA
S2725
ENCRYPT ORIGINAL METADATA CORRESPONDING TO CUT OFF LOCATION WITH SHARED KEY OF SIGNATURE DEVICE 205
S2726
WRITE STILL IMAGE DATA AND ORIGINAL METADATA INTO FILE TO BE CUT OFF STILL IMAGE DATA FILE
S2727
OBTAIN CUT OFF TIME AND SHELTER IT INTO STORAGE AREA
S2728
OBTAIN EXTRACTOR ID AND SHELTER IT INTO STORAGE AREA
S2729
GENERATE CUT OFF METADATA
F
G

FIG. 27D

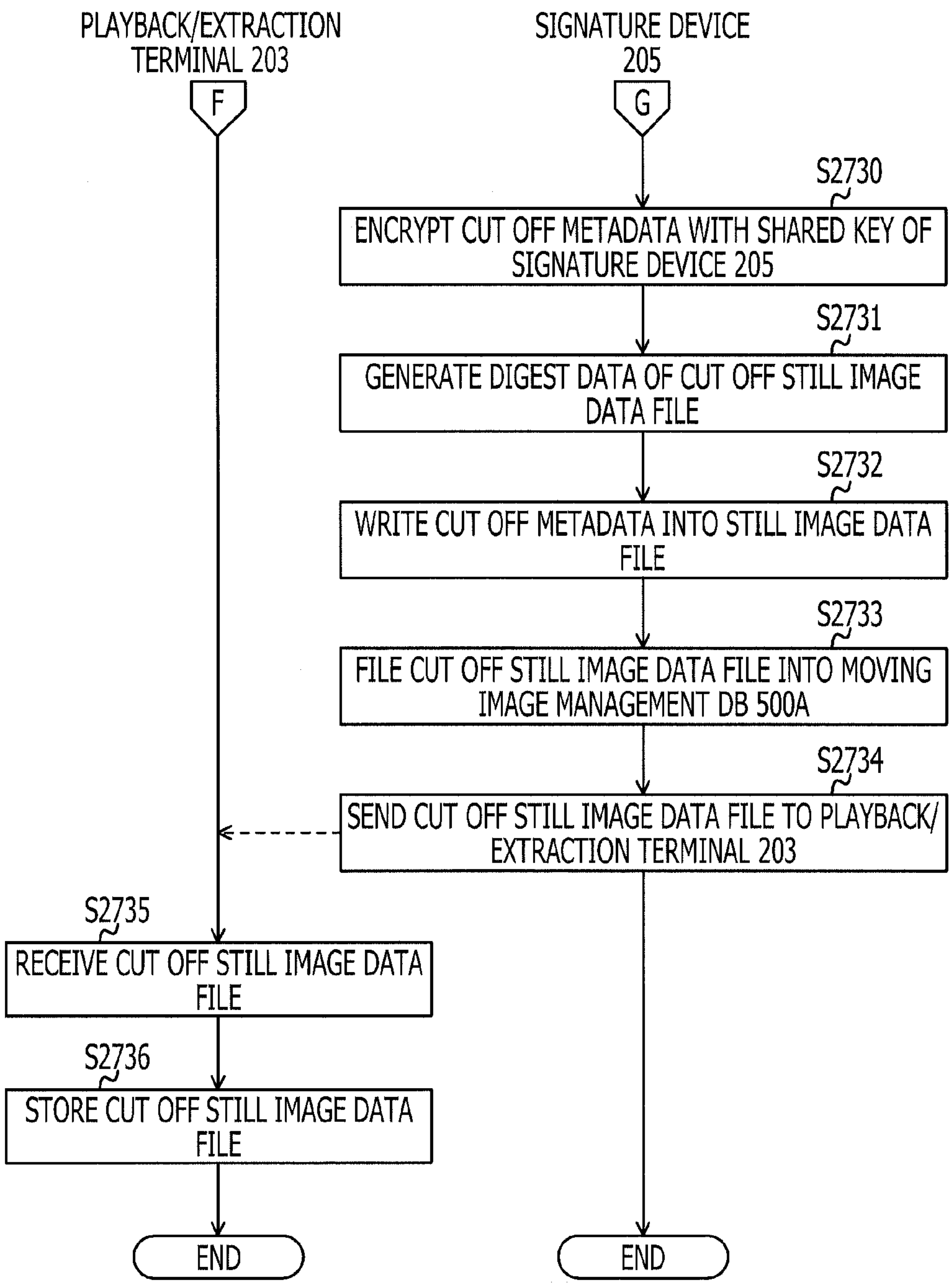

PLAYBACK/EXTRACTION TERMINAL 203
SIGNATURE DEVICE 205
F
G
S2730
ENCRYPT CUT OFF METADATA WITH SHARED KEY OF SIGNATURE DEVICE 205
S2731
GENERATE DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE
S2732
WRITE CUT OFF METADATA INTO STILL IMAGE DATA FILE
S2733
FILE CUT OFF STILL IMAGE DATA FILE INTO MOVING IMAGE MANAGEMENT DB 500A
S2734
SEND CUT OFF STILL IMAGE DATA FILE TO PLAYBACK/EXTRACTION TERMINAL 203
S2735
RECEIVE CUT OFF STILL IMAGE DATA FILE
S2736
STORE CUT OFF STILL IMAGE DATA FILE
END
END

FIG. 28

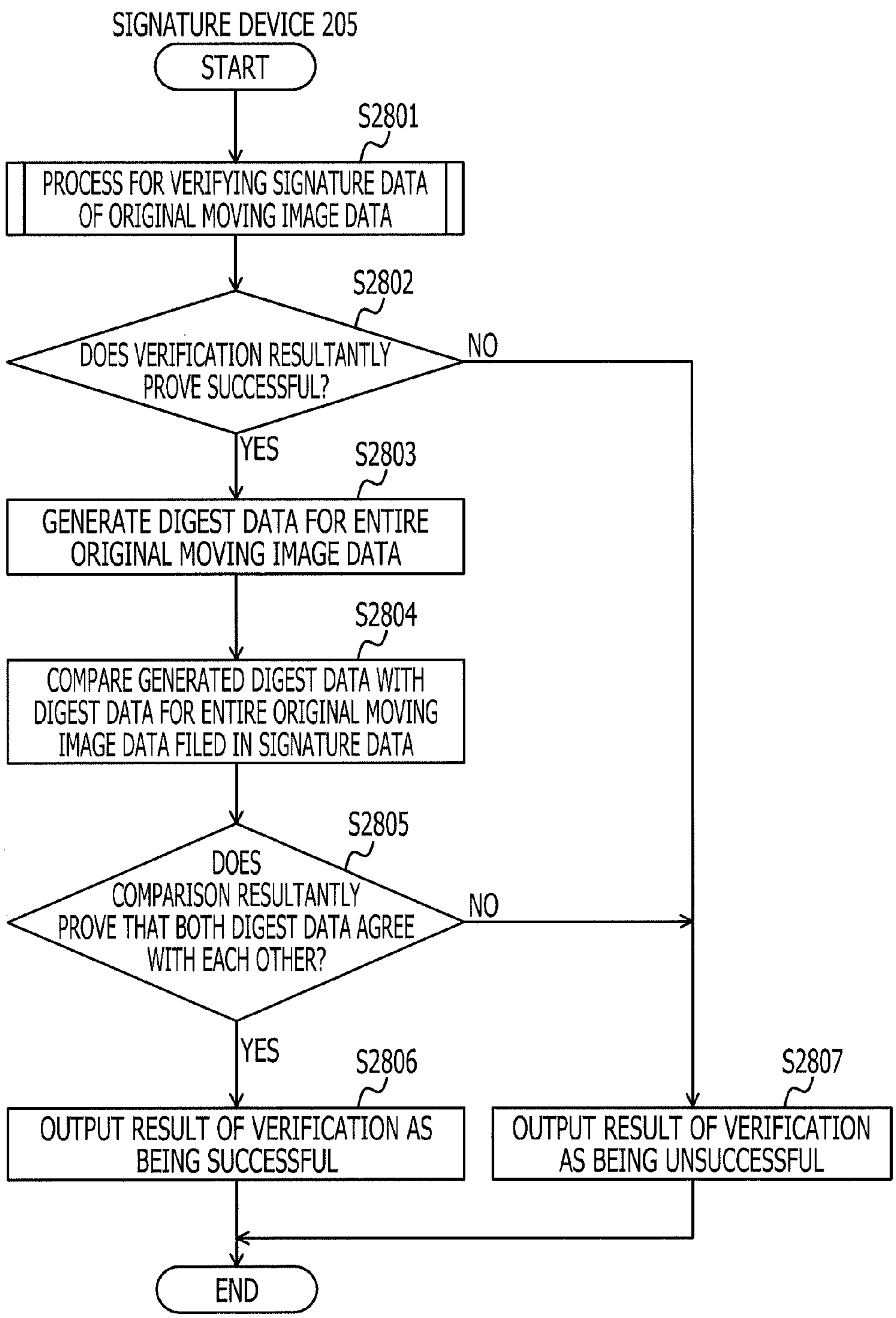

SIGNATURE DEVICE 205
START
S2801
PROCESS FOR VERIFYING SIGNATURE DATA OF ORIGINAL MOVING IMAGE DATA
S2802
DOES VERIFICATION RESULTANTLY PROVE SUCCESSFUL?
NO
YES
S2803
GENERATE DIGEST DATA FOR ENTIRE ORIGINAL MOVING IMAGE DATA
S2804
COMPARE GENERATED DIGEST DATA WITH DIGEST DATA FOR ENTIRE ORIGINAL MOVING IMAGE DATA FILED IN SIGNATURE DATA
S2805
DOES COMPARISON RESULTANTLY PROVE THAT BOTH DIGEST DATA AGREE WITH EACH OTHER?
NO
YES
S2806
OUTPUT RESULT OF VERIFICATION AS BEING SUCCESSFUL
S2807
OUTPUT RESULT OF VERIFICATION AS BEING UNSUCCESSFUL
END

FIG. 29A

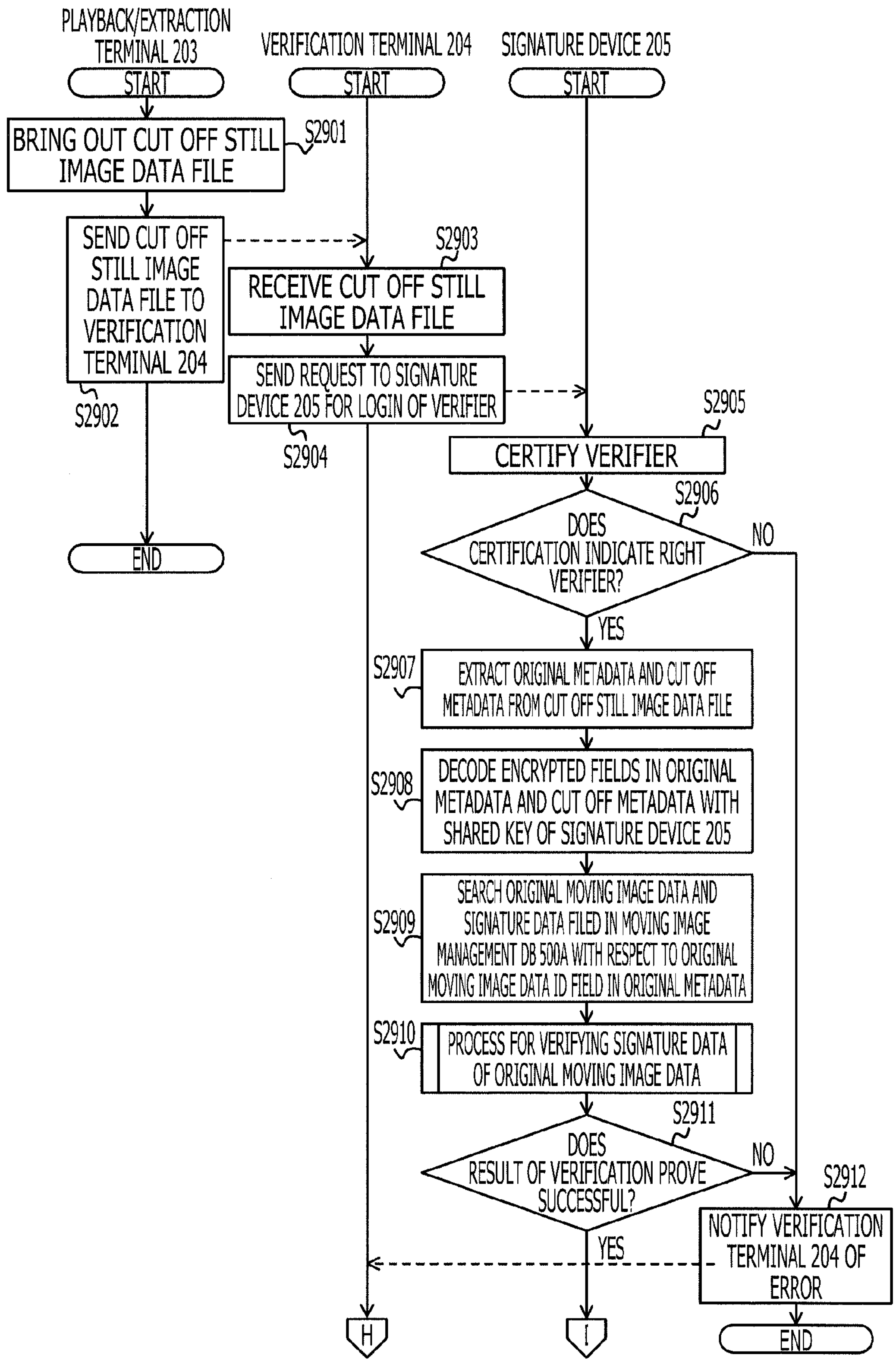
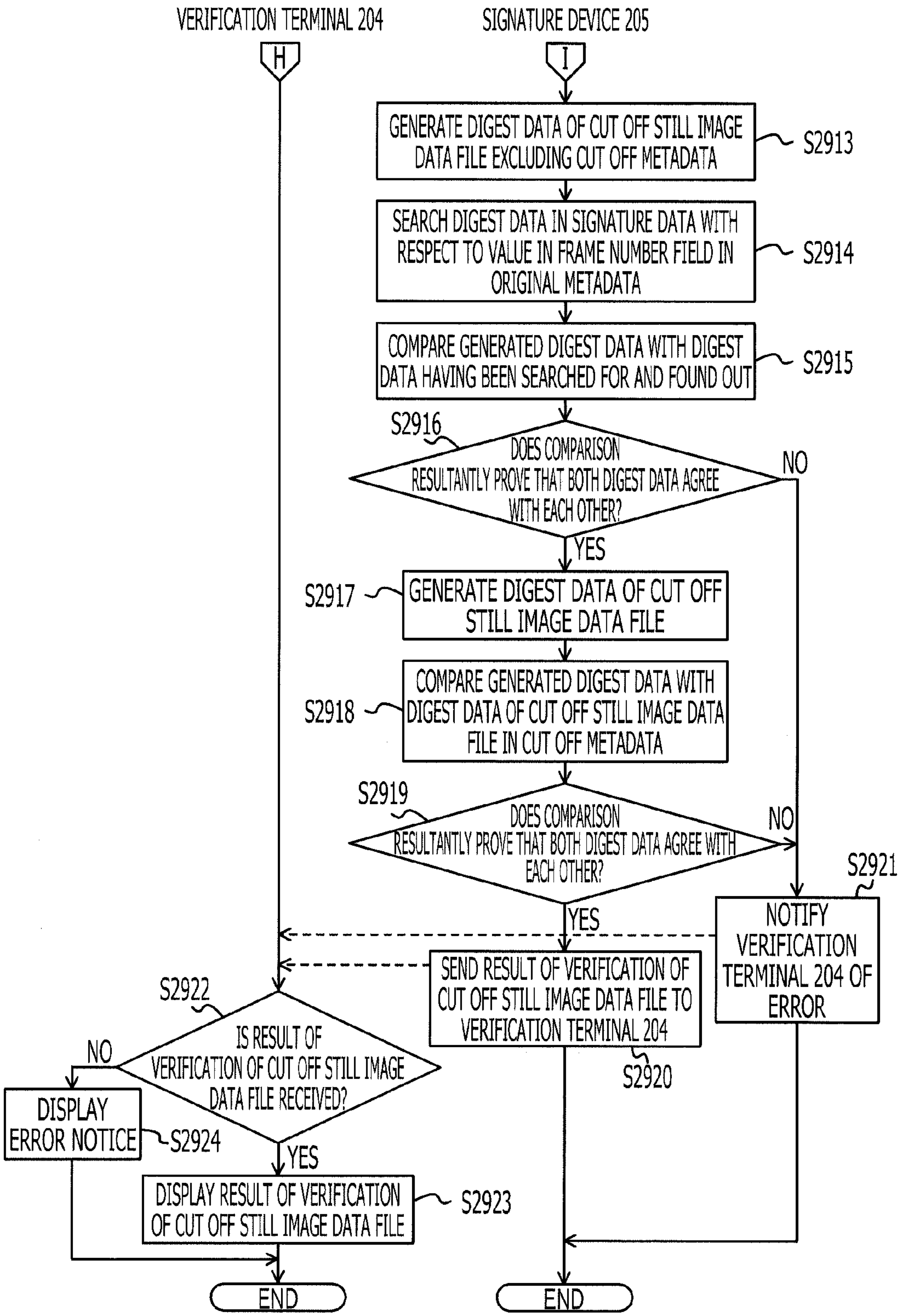

PLAYBACK/EXTRACTION TERMINAL 203
VERIFICATION TERMINAL 204
SIGNATURE DEVICE 205
START
START
START
BRING OUT CUT OFF STILL IMAGE DATA FILE
S2901
SEND CUT OFF STILL IMAGE DATA FILE TO VERIFICATION TERMINAL 204
S2902
S2903
RECEIVE CUT OFF STILL IMAGE DATA FILE
SEND REQUEST TO SIGNATURE DEVICE 205 FOR LOGIN OF VERIFIER
S2904
S2905
CERTIFY VERIFIER
S2906
DOES CERTIFICATION INDICATE RIGHT VERIFIER?
NO
YES
END
S2907
EXTRACT ORIGINAL METADATA AND CUT OFF METADATA FROM CUT OFF STILL IMAGE DATA FILE
S2908
DECODE ENCRYPTED FIELDS IN ORIGINAL METADATA AND CUT OFF METADATA WITH SHARED KEY OF SIGNATURE DEVICE 205
S2909
SEARCH ORIGINAL MOVING IMAGE DATA AND SIGNATURE DATA FILED IN MOVING IMAGE MANAGEMENT DB 500A WITH RESPECT TO ORIGINAL MOVING IMAGE DATA ID FIELD IN ORIGINAL METADATA
S2910
PROCESS FOR VERIFYING SIGNATURE DATA OF ORIGINAL MOVING IMAGE DATA
S2911
DOES RESULT OF VERIFICATION PROVE SUCCESSFUL?
NO
YES
S2912
NOTIFY VERIFICATION TERMINAL 204 OF ERROR
END
H
I

FIG. 29B


VERIFICATION TERMINAL 204
SIGNATURE DEVICE 205
H
I
GENERATE DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE EXCLUDING CUT OFF METADATA
S2913
SEARCH DIGEST DATA IN SIGNATURE DATA WITH RESPECT TO VALUE IN FRAME NUMBER FIELD IN ORIGINAL METADATA
S2914
COMPARE GENERATED DIGEST DATA WITH DIGEST DATA HAVING BEEN SEARCHED FOR AND FOUND OUT
S2915
S2916
DOES COMPARISON RESULTANTLY PROVE THAT BOTH DIGEST DATA AGREE WITH EACH OTHER?
NO
YES
S2917
GENERATE DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE
S2918
COMPARE GENERATED DIGEST DATA WITH DIGEST DATA OF CUT OFF STILL IMAGE DATA FILE IN CUT OFF METADATA
S2919
DOES COMPARISON RESULTANTLY PROVE THAT BOTH DIGEST DATA AGREE WITH EACH OTHER?
NO
YES
S2921
NOTIFY VERIFICATION TERMINAL 204 OF ERROR
SEND RESULT OF VERIFICATION OF CUT OFF STILL IMAGE DATA FILE TO VERIFICATION TERMINAL 204
S2920
S2922
IS RESULT OF VERIFICATION OF CUT OFF STILL IMAGE DATA FILE RECEIVED?
NO
YES
DISPLAY ERROR NOTICE
S2924
DISPLAY RESULT OF VERIFICATION OF CUT OFF STILL IMAGE DATA FILE
S2923
END
END

SIGNATURE DEVICE AND SIGNATURE METHOD

CROSS-REFERENCE RELATED TO APPLICATION

This application is a divisional application of application Ser. No. 13/421,092, which was filed on Mar. 15, 2012 and is based upon and claims the benefit of priority of the prior Japanese Patent Application No. 2011-61788, filed on Mar. 18, 2011, the entire contents of both of which are incorporated herein by reference.

This application is based upon and claims the benefit of priority of the prior Japanese Patent Application No. 2011-61788, filed on Mar. 18, 2011, the entire contents of which are incorporated herein by reference.

FIELD

The embodiment discussed herein is related to a signature device and a signature method which generates and verifies a signature.

BACKGROUND

In recent years, an observation camera is installed in a store, a busy street or a condominium and a drive recorder is installed in a business use vehicle as usual, and moving image data is treated as evidence in an increasing number of cases. Further, it is in the process of being a common sense that a store records a conversation between a customer and an operator and keeps the record as evidence in order to deal with a trouble concerning trading on the phone or supporting business.

The store provides a videotape or an image or audio file as it is at present so as to give moving image data or voice as evidence. If, however, image or voice is stored increasingly in digital forms, it can be easily altered or edited and thus will ask for third-party authentication such as a signature or timestamp so as to be treated as evidence. Services or products which record voice of a telephone operator with a timestamp are on sale in practice. It is expected that these kinds of technologies will be increasingly in demand.

Incidentally, a method for dividing contents in an electronic document into headings, calculating summary data of each of the headings, and adding an electronic signature to collection of the summary data of each of the headings is used as a technology for detecting a third-party's alteration. The summary data mentioned here corresponds to hash data calculated by the use of a cryptographic one-way hash function called a message digest.

Further, a technology for providing an image file with an expanded area and recording related data together with image data is disclosed with regard to image filing. Further, another technology for providing an image file with an expanded area and recording a plurality of copies or partial copies of appended data corresponding to image data is disclosed with regard to image filing (Japanese Laid-open Patent Publications No. 2005-33503 and No. 2004-5934, e.g., discuss those technologies).

Further, a form of Internet service called cloud computing (called "cloud" hereafter) in which a user can use services provided by servers on the network without being aware of them has been mainstreamed in recent years. Services for using the cloud so as to pile up and manage digitized moving images and voices in a center server in the cloud and to distribute content are being mainstreamed.

SUMMARY

According to an aspect of the invention, a signature device including a storage unit configured to store moving image data, and a processor configured to extract original metadata from moving image data for the image data of each of a plurality of images forming the moving image data, the original metadata including location data of the image data and identification data of the moving image data, to encode the image data of each of the images into still image data in accordance with an image format, to write the still image data into a first area, to write the original metadata extracted by the extractor into a second area, the first area and the second area being included in a storage area of a still image data file in which the still image data is filed, and to generate summary data for the still image data file.

The object and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the claims. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is an explanatory diagram which depicts exemplary operations of a signature system of the embodiment in time of signature generation and in time of verification;

FIG. **2** is an explanatory diagram which depicts an exemplary device group of the signature system;

FIG. **3** is a block diagram which depicts an exemplary function of an authenticator device;

FIG. **4** is a block diagram which depicts an exemplary hardware constitution of the signature device;

FIG. **5** is a block diagram which depicts an exemplary function of the signature device;

FIG. **6** is a block diagram which depicts exemplary functions of a signature generator, an image extractor and a signature verifier;

FIG. **7** is an explanatory diagram which depicts an exemplary operation according to a signature algorithm;

FIG. **8** is an explanatory diagram which depicts exemplary image types of compressed moving image data and their arrangement;

FIG. **9** illustrates an exemplary case in which P- and B-pictures of compressed moving image data are converted into independent images;

FIG. **10** is an explanatory diagram which exemplarily depicts what is stored in a user data list;

FIG. **11** is an explanatory diagram which depicts an exemplary method for generating a signature to be put to original moving image data;

FIG. **12** is an explanatory diagram which illustrates exemplary image data that original metadata is added to;

FIG. **13** is an explanatory diagram which exemplarily depicts what is stored in an original moving image data registration list;

FIG. **14** is an explanatory diagram which depicts an exemplary method for generating a cut off still image data file;

FIG. **15**A is an explanatory diagram which depicts an exemplary cut off still image data file that original metadata and cut off metadata are added to;

FIG. **15**B is another explanatory diagram which depicts an exemplary cut off still image data file that original metadata and cut off metadata are added to;

FIG. **16** is an explanatory diagram which depicts an exemplary method for verifying a signature put to a cut off still image data file;

FIG. **17** is an explanatory diagram which depicts an exemplary screen that a list of original moving image data is displayed on;

FIG. **18** is an explanatory diagram which depicts an exemplary screen that a cut off still image data file is made on;

FIG. **19** is an explanatory diagram which depicts an exemplary screen that a cut off still image data file to be verified is chosen on;

FIG. **20** is an explanatory diagram which depicts an exemplary screen that a result of verification of a cut off still image data file is displayed on;

FIG. **21** is an explanatory diagram which depicts an exemplary screen that property data of a cut off still image data file is displayed on;

FIG. **22** is a flowchart which depicts an exemplary process for registering a public key to be used for electronic signature;

FIG. **23** is a flowchart which depicts examples of a process for sending and receiving data that an electronic signature is put to and a verification process to be run by a receiver;

FIG. **24** is a flowchart which depicts an exemplary process for generating original moving image data;

FIG. **25**A is a first page of a flowchart which depicts an exemplary process for generating a signature to be put to original moving image data;

FIG. **25**B is a second page of the flowchart which depicts the exemplary process for generating the signature to be put to the original moving image data;

FIG. **26** is a flowchart which depicts a process for generating an independent frame;

FIG. **27**A is a first page of a flowchart which depicts an exemplary process for generating a cut off still image data file;

FIG. **27**B is a second page of the flowchart which depicts the exemplary process for generating the cut off still image data file;

FIG. **27**C is a third page of the flowchart which depicts the exemplary process for generating the cut off still image data file;

FIG. **27**D is a fourth page of the flowchart which depicts the exemplary process for generating the cut off still image data file;

FIG. **28** is a flowchart which depicts an exemplary process for verifying signature data of original moving image data;

FIG. **29**A is a first page of a flowchart which depicts an exemplary process for verifying a cut off still image data file; and

FIG. **29**B is a second page of the flowchart which depicts the exemplary process for verifying the cut off still image data file.

DESCRIPTION OF EMBODIMENTS

According to a cloud service included in ordinary technologies described above for providing third-party's authentication, however, moving image data or signature data is stored as the original in a center server. As the center server verifies part of the moving image data in condition that the large-sized moving image data and the signature data are integrated and managed in a table, etc., there is a problem in that it is difficult to identify related data to be used for confirming the original.

An object of the embodiment is to provide a signature device and a signature method which facilitates identification of related data to be used for confirming the original in order to reduce the above problems that the ordinary technologies have.

The embodiment of a disclosed signature device and a signature method will be explained in detail with reference to the drawings.

FIG. **1** is an explanatory diagram which depicts exemplary operations of a signature system **100** of the embodiment in time of signature generation and verification. The operation in time of signature generation will be explained first. The signature system **100** including a signature device of the embodiment generates a piece of still image information (still image data) for every frame in a piece of moving image information (moving image data) **101** on the basis of the image information (image data) of each of the frames. In time of generation, the signature system **100** writes metadata including an ID (IDentification) for identification of the moving image data **101** and a frame number into an expanded area according to an image format in a still image information file (still image data file) in which still image data is filed according to the image format of the still image data. Incidentally, the metadata is additional data related to the data to be generated itself.

Suppose that a JPEG (Joint Photographic Experts Group) format which is one of standard formats of compressed still images is used for the image format of the still image data file of the embodiment. Further, suppose that an MPEG (Moving Picture Experts Group) format which is one of standard formats of compressed moving images is used for moving image data.

After writing the metadata, the signature system **100** generates digest data which summarizes the still image data file that the metadata is written into, and stores the digest data generated in order of the frame numbers in a storage area. After storing the digest data, the signature system **100** makes a digest data group stored in order of the frame numbers an object to be signed **102**, and provides the object to be signed **102** with en electronic signature.

The signature system **100**, e.g., encodes a frame **1** into still image data **1**. Then, the signature system **100** writes the metadata into an expanded area of a still image data file **1** in which the still image data **1** is filed. After writing the metadata, the signature system **100** generates still image data file **1** digest data which is digest data of the still image data file **1**. The signature system **100** similarly generates still image data file **2** digest data and still image data file **3** digest data. After generating them, the signature system **100** provides the object to be signed **102** filed in order of the frame numbers such as the still image data file **1** digest data, still image data file **2** digest data, still image data file **3** digest data and so on with an electronic signature **103**.

Further, the signature system **100** outputs a still image data file for which metadata is written into an expanded area of the still image data file in order to open still image data to the public. The signature system **100** opens the still image data file **2** as depicted in FIG. **1**.

Then, the operation in time of verification will be explained. The signature system **100** extracts metadata filed in an expanded area from a still image data file to be verified. As the still image data file **2** is supposed to be the image to be verified in FIG. **1**, the signature system **100** extracts an ID and a frame number: 2 of the moving image data **101**.

After extracting them, the signature system **100** searches a stored digest data group of the object to be signed **102** for digest data corresponding to the data that the combination of the ID and the frame number of the moving image data **101** is extracted from. As the frame number: 2 is supposed, the still image data file **2** digest data is searched for in FIG. **1**. If the still image data file **2** digest data agrees with the digest data of the still image data file to be verified after the search, the signature system **100** can prove no alteration.

The signature system **100** signs the object to be signed including the metadata which facilitates identification of signature data for confirming the original so that the signature data can be easily identified in time of signature verification as described above. The signature device of the embodiment will be explained hereafter by the use of FIGS. **2** to **29**B.

FIG. **2** is an explanatory diagram which depicts an exemplary device group of the signature system **100**. The signature system **100** includes an authenticator device **201**, an upload terminal **202**, a playback/extraction terminal **203**, a verification terminal **204** and a signature device **205**. Those devices, the authenticator device **201** through the signature device **205**, are each connected to a network **206**. Further, the upload terminal **202** can communicate with a picture recorder terminal **207**.

The authenticator device **201** is a server of an authenticator which manages electronic signature data. An electronic signature is formed by summary data that an object to be signed is summarized into encrypted with a secret key that a transmitter has. Then, the transmitter sends the electronic signature, the object to be signed and a certificate of a public key to a receiver. The receiver checks validity of the certificate of the public key, decodes the encrypted electronic signature with the public key included in the certificate of the public key, and compares the decoded electronic signature with summary data obtained from the object to be signed. The authenticator device **201** decides whether the electronic signature is sent from a right party or not depending upon whether the comparison proves agreement or not. The process will be described later in detail with reference to FIG. **23**.

Further, the summary data described above is hash data calculated for the object to be signed by the use of a cryptographic one-way hash function. The summary data is called a message digest as well, in order to imply that the object to be signed can be compressed in size. Further, only the hash data generated by the use of the cryptographic one-way hash function is generated only from the object to be signed, and is characterized by a feature that original data will not be restored from the generated hash data.

Thus, the cryptographic one-way hash function is often used for data encryption or electronic signature generation. The cryptographic one-way hash function incorporates algorithms MD5 (Message Digest 5), SHA (Secure Hash Algorithm)-1 or SHA-256. Which algorithm is used for data to generate summary data (algorithm for generating hash data) is written in the certificate of the public key.

The upload terminal **202** obtains and stores streaming data recorded by the picture recording terminal **207** (called original moving image data, hereafter), and runs a process for registering the original moving image data on the signature device **205**.

The playback/extraction terminal **203** is a terminal that an extractor uses so as to play back and extract the original moving image data in the signature device **205**. The verification terminal **204** is a terminal that a verifier uses so as to work the signature device **205** and verify part of the original cut off the still image data file.

The signature device **205** is a center server in the signature system **100**. The signature device **205** specifically stores and piles original moving image data sent from the upload terminal **202**, and runs a process for generating a signature. Further, the signature device **205** is instructed by the playback/extraction terminal **203** so as to run a process for playing back and extracting the stored and piled moving image data. Further, the signature device **205** is instructed by the verification terminal **204** so as to verify the original of the stored and piled moving image data and to verify part of the original for a cut off the still image data file.

The network **206** may correspond to every type of communication network such as the Internet, an intranet, a wide area network, etc. The picture recording terminal **207** is a terminal which films and records streaming data to be made the original moving image data. A handheld video camera or industrial surveillance camera, e.g., is employed as the picture recording terminal **207**. The picture recording terminal **207** can communicate with the upload terminal **202**. Meanwhile, the picture recording terminal **207** may exchange data with the upload terminal **202** by means of a removable recording media that the terminals **207** and **202** can be equipped with, a USB (Universal Serial Bus) memory or an exclusive-use cable according to IEEE 1394, etc.

FIG. **3** is a block diagram which depicts an exemplary function of the authenticator device **201**. The authenticator device **201** includes a public key DB (DataBase) **301**, a certificate issuer **302**, a certificate verifier **303** and a communicator **304**. A public key of the signature device **205** is piled on the public key DB **301**. The certificate issuer **302** issues a certificate of a public key as requested. The certificate verifier **303** verifies a certificate of a public key. The communicator **304** is connected to the network **206** and performs communication trough the network **206**.

(Hardware Constitution of Signature Device **205**)

FIG. **4** is a block diagram which depicts an exemplary hardware constitution of the signature device **205**. The signature device **205** includes a CPU (Central Processing Unit) **401**, a ROM (Read-Only Memory) **402** and a RAM (Random Access Memory) **403** as depicted in FIG. **4**. The signature device **205** further includes a magnetic disk drive **404**, a magnetic disk **405**, an optical disk drive **406** and an optical disk **407** as storage devices. The signature device **205** further includes an I/F (Interface) **408**. The respective portions are connected with one another through a bus **409**.

The CPU **401** mentioned here controls the entire signature device **205**. The ROM **402** stores therein programs including a boot program. The RAM **403** is used as a work area for the CPU **401**. The magnetic disk drive **404** controls operations to read and write data from and to the magnetic disk **405** as controlled by the CPU **401**. The magnetic disk **405** stores therein written data as controlled by the magnetic disk drive **404**.

The optical disk drive **406** controls operations to read and write data from and to the optical disk **407** as controlled by the CPU **401**. The optical disk **407** stores therein written data as controlled by the optical disk drive **406**, or lets a computer read data stored in the optical disk **407**.

The I/F **408** is connected to the network such as a LAN (Local Area Network), a WAN (Wide Area Network) or the Internet through a communication line, and is connected to another device through the network **206**. Then, the I/F **408** controls the interface between the network **206** and the inside of the signature device **205**, and controls data input and data output from and to an external device. A modem or LAN adaptor, e.g., may be employed as the I/F **408**.

Incidentally, the signature device **205** may include hardware components used as user interfaces such as a display monitor, a keyboard or a mouse if operated directly by a user.

FIG. **5** is a block diagram which depicts an exemplary function of the signature device **205**. The signature device **205** can access a moving image management DB **500***a*, a moving image management TB **500***b*, a key management DB **501***a*, a key management TB **501***b*, a user management DB **502***a*, a user management TB **502***b* and a signature device data management TB **503**. Further, the signature device **205** includes a signature generator **504**, an image extractor **505**, a signature verifier **506** and a communicator **507**. The databases and tables, i.e., the moving image management DB **500***a* through the signature device data management TB **503** are each stored in the storage devices such as the ROM **402**, the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc. Further, the functional portions, i.e., the signature generator **504** through the communicator **507** each implement their function by means of the CPU **401** running programs stored in the storage devices.

The moving image management DB **500***a* is a database in which data received from the upload terminal **202** and data sent to the playback/extraction terminal **203** are stored. The moving image management TB **500***b* is a table for managing data to control access to the moving image management DB **500***a*.

The key management DB **501***a* is a database in which a certificate of a public key issued by the authenticator device **201**, a secret key for signature corresponding to the certificate of the public key, and an encryption key for encrypting two kinds of metadata that the embodiment is related to which are original metadata and cut off metadata are stored. The key management TB **501***b* is a table for managing data to control access to the key management DB **501***a*. Incidentally, the metadata and cut off metadata will be explained with reference to FIG. **6**.

The user management DB **502***a* is a database for managing user data to control user's access to the signature device **205**. The user management TB **502***b* is a table for managing data to control access to the user management DB **502***a*. The signature device data management TB **503** is a table in which peculiar data to uniquely identify the signature device **205** is stored.

The signature generator **504** has a function to put signature data to moving image data. The image extractor **505** has a function to extract an image on a location to be extracted specified in the original moving image data as a cut off still image data file as instructed by the playback/extraction terminal **203**. The signature verifier **506** receives the cut off still image data file from the verification terminal **204** and verifies part of the original. The communicator **507** performs communication through the network **206**.

(Functions of the Signature Generator **504**, the Image Extractor **505** and the Signature Verifier **506**)

Then, exemplary functions of the signature generator **504**, the image extractor **505** and the signature verifier **506** will be explained. FIG. **6** is a block diagram which depicts exemplary functions of the signature generator **504**, the image extractor **505** and the signature verifier **506**. Incidentally, the signature generator **504** and the image extractor **505** having some of the functions in common will be explained together.

Further, the signature generator **504** includes an input unit **601**, a moving image decoder **602**, a transfer unit **603**, a converter **604** and a still image encoder **605**. The signature generator **504** further includes an original metadata extractor **606**, an encryptor **607**, a writer **608**, a digest data generator **611** and an electronic signature generator **612**.

The signature extractor **505** includes a specifying unit **609**, a moving image decoder **602**, a transfer unit **603**, a converter **604** and a still image encoder **605**. The signature extractor **505** further includes an original metadata extractor **606**, an encryptor **607**, a cut off metadata generator **610**, a digest data generator **611**, an electronic signature generator **612** and an electronic signature verifier **613**.

Further, the signature verifier **506** includes an input unit **621**, an electronic signature verifier **622**, a metadata extractor **623**, a decoder **624**, a searcher **625**, a digest data generator **626**, a decision unit **627** and an output unit **628**. Further, the signature generator **504**, the image extractor **505** and the signature verifier **506** can each access a storage unit **630**.

This function to be a controller is specifically implemented, e.g., by the CPU **401** running the programs stored in the ROM **402**, the RAM **403**, the magnetic disk **405**, the optical disk **407** and so on depicted in FIG. **4**. Meanwhile, the function may be implemented by another CPU running the programs via the I/F **408**. The function to be the controller is implemented by the input unit **601** through the output unit **628**.

The input unit **601** has a function to input data. The input unit **601** inputs, e.g., original moving image data. Incidentally, inputted data is stored in storage areas such as the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The moving image decoder **602** has a function to analyze and obtain moving image data for every one of plural images in the moving image data. Types of the image data includes a predictive frame which will not be played back independently and a moving image frame which can be played back independently. The moving image decoder **602** analyzes and obtains picture data for every frame, e.g., by means of an MPEG decoder according to an MPEG format. Incidentally, a predictive frame is a P- or B-picture according to MPEG, and a moving image frame which can be independently played back is called an I-picture. The moving image data complies with various moving image formats including MPEG-1, MPEG-2, H264/AVC, etc. Incidentally, the decoded frames are each stored in a storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The transfer unit **603** has functions to transfer a predictive frame having been inputted to the converter **604** and to transfer a first or second one of moving image frames having been inputted to the still image encoder **605**. There are two types of the moving image frames which are a first moving image frame having been present in the moving image data from the beginning and a second moving image frame that a predictive frame is converted into and is enabled to be played back by the converter **604**. If the moving image data is in an MPEG format, e.g., the transfer unit **603** transfers a moving image frame enabled to be independently played back that P- and B-pictures which are predictive frames are converted into by the converter **604** to the still image encoder **605**. Incidentally, the transferred data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The converter **604** has a function to convert a predictive frame which will not be independently played back into a second moving image frame which can be independently played back on the basis of a first moving image frame which can be independently played back. The converter **604** specifically converts, e.g., a P- and B-pictures which are predictive frames into a moving image frame which can be played back on the basis of an I-picture which can be independently played back. Further, the converter **604** converts a P-picture on the basis of a preceding I- or P-picture. Further, the converter **604** converts a B-picture on the basis of preceding and succeeding I- or P-pictures. Incidentally, the converted frame is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The still image encoder **605** has a function to encode a first or second moving image frame into still image data according to an image format. The still image encoder **605** encodes, e.g., a moving image frame that P- and B-pictures have been converted into according to an MPEG format and a frame which is an I-picture into still image data according to the image format. The image format except for a JPEG format is a JPEG 2000 format, a PNG (Portable Network Graphic) format, etc. Incidentally, the encoded still image data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The original metadata extractor **606** has a function to extract the original metadata including location data of image data and identification data of moving image data from the moving image data for each of the plural images. Incidentally, the original metadata is metadata for the original moving image data to be the original. The original metadata may include, e.g., generation time of the original moving image data, an ID of the signature device **205** that the original moving image data is registered in and so on in addition to location data of the image data and the identification data of the moving image data.

The original metadata extractor **606** extracts, e.g., original metadata, i.e., an original metadata ID "NA419" and location data "1" from the original moving image data for the first image in the original moving image data. Then, the original metadata extractor **606** extracts original metadata, i.e., the original metadata ID "NA419" and location data "2" from the original moving image data for the second image in the original moving image data. The original metadata extractor **606** extracts original metadata for all the images in the original moving image data in this way. Incidentally, the extracted original metadata is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The encryptor **607** has a function to encrypt at least part of the original metadata. The encryptor **607** encrypts, e.g., location data of the image data and identification data of the moving image data in the original metadata. Further, the encryptor **607** may encrypt at least part of the cut off metadata. Incidentally, the encrypted original metadata or cut off metadata is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The writer **608** writes still image data for every image into a first area in an area that a still image data file into which image data is encoded according to the image format is stored in. Further, the writer **608** has a function to write original metadata extracted by the original metadata extractor **606** into a second area.

Incidentally, the first area is an area in which a bit pattern of encoded image data such as a DQT (Define Quantization Table) marker, a DHT (Define Huffman Table) marker, an SOF (Start of Frame) marker or an SOS (Start of Scan) marker, etc. is filed if the image is in a JPEG format. The second area is an area which can be used for various purposes including APP0-APP15 markers, differently from the first area. Incidentally, the second area may be a tEXt chunk in which text data can be embedded in case of another image format, e.g., PNG.

Further, one of the APP0-APP15 markers may have been used by another application program in some cases. If that is the case, the writer **608** makes an unused one of the APP0-APP15 markers the second area and writes the original metadata into the second area. The writer **608**, e.g., files the image data and the original metadata into the first area and the second area, respectively, in order to encode the moving image frame by means of the still image encoder **605**.

Further, the writer **608** may write cut off metadata generated by the cut off metadata generator **610** into a third area in a still image data file in which still image data corresponding to location data specified by the specifying unit **609** is filed. The still image data file in which still image data corresponding to the location data specified by the specifying unit **609** is filed is a cut off still image data file. Incidentally, the third area is an area in the APP0-APP15 markers except where the original metadata is filed, e.g., in case of a JPEG format.

Further, the writer **608** may write summary data of a combination of the cut off still image data file and property data of its own into a fourth area in the cut off still image data file. The fourth area is an area in the APP0-APP15 markers except where the original metadata or the cut off metadata is filed, e.g., in case of a JPEG format. Further, if the cut off metadata is filed in the APP2 marker, an area indicated by the APP2 marker may include both the third area in which the cut off metadata is filed and the fourth area. Incidentally, the cut off still image data file that the summary data has been written into is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The specifying unit **609** has a function to specify location data of image data on the basis of location data of one of plural images specified by a user to whom identification data is set. The specifying unit **609** specifies, e.g., a frame number: 12355 which is location data of image data extracted by an extractor whom the signature device **205** logged in. Incidentally, the specified location data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The cut off metadata generator **610** has a function to generate cut off metadata including time when the specifying unit **609** specified the location data and identification data of a user who specified the location data by means of the specifying unit **609**. The cut off metadata is metadata related to a cut off operation having been done. The cut off metadata generator **610** generates cut off metadata including, e.g., specified time "15A3:32 (HH:MM:SS), Aug. 13, 2010" and an ID of the extractor, "Suzuki Minoru: S15256". Incidentally, the generated cut off metadata is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The digest data generator **611** generates summary data for a still image data file of every image after the writing operation done by the writer **608**. The digest data generator **611** generates, e.g., digest data for a still image data file encoded according to a JPEG format that the original metadata is filed in.

Further, the digest data generator **611** may generate summary data of a combination of a cut off still image data file and property data of its own. Incidentally, the digest data generator **611** may employ an ID of the signature device **205** or of a network card of the signature device for its own property data.

Further, how to combine the cut off still image data file with the property data of the signature device **205** may be such that, e.g., a bit pattern of the property data of the signature device **205** may be coupled either before or after a bit pattern of the cut off still image data file. The digest data generator **611** may calculate an exclusive logical sum of the bit pattern of the cut off still image data file and the bit pattern of the property data of the signature device **205** in order to combine them in a different way.

Further, the digest data generator **611** may generate new summary data for a combination of original metadata of a cut off still image data file, cut off metadata and property data of the signature device **205**. How to combine the original metadata of a cut off still image data file, the cut off metadata and the property data of the signature device **205** may be such that, e.g., bit patterns of the original metadata, the cut off metadata and the property data of the signature device **205** in the above order or in different order. Incidentally, the generated digest data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The electronic signature generator **612** generates an electronic signature for digest data generated by the digest data generator **611** and made an object to be signed. The object to be signed may include digest data of entire moving image data apart from digest data of a still image data file. The electronic signature generator **612** generates an electronic signature, e.g., by encrypting a collection of digest data having n frames with a secret key. Incidentally, the generated electronic signature is stored in the storage unit **630**.

The electronic signature verifiers **613** and **622** each have a function to verify authenticity of an electronic signature. If the electronic signature verifier **613** decodes an electronic signature stored in the storage unit **630** with a public key and a result of decoding agrees with summary data of an object to be electronically signed, specifically e.g., the electronic signature verifier **613** outputs a conclusion that the electronic signature is guaranteed to be authentic. Incidentally, the result of the verification is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The input unit **621** has a function to input a still image data file to be verified. The input unit **621** inputs a still image data file according to, e.g., a JPEG format, etc. Incidentally, the inputted still image data file is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The metadata extractor **623** has a function to extract data filed in the second area in the still image data file to be verified inputted by the input unit **621**. The metadata extractor **623** detects markers in the still image data file to be verified if the still image data file to be verified is, e.g., in a JPEG format. Upon detecting a marker that the original metadata or cut off metadata is filed on, the metadata extractor **623** extracts data filed in an area specified by the relevant marker. Incidentally, the extracted data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc. Instead, a pointer indicating where the data is extracted and data indicating an area length may be stored in the storage area.

The decoder **624** has a function to decode encrypted data of the original metadata. Further, the decoder **624** decodes encrypted data in the cut off metadata. Incidentally, the decoded data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The searcher **625** has a function to search a summary data group stored in the storage unit **630** for summary data for which a combination of identification data of moving image data and location data of image data corresponds to data extracted by an extractor. Suppose, e.g., that there are two blocks of original moving image data stored in the storage unit **630** and their IDs are “DA104” and “NA419” each. Further, suppose that a summary data group of frame numbers 1 through 40000 of original moving image data having the identification data “DA104” is stored in the storage unit **630**, and so is a summary data group of frame numbers 1 through 30000 of original moving image data having the identification data “NA419”. Further, suppose that data extracted by the metadata extractor **623** is of “NA419” and “12355”.

At this time, the searcher **625** searches the summary data group stored in the storage unit **630** for a summary data of a frame number 12355 of the original moving image data having the identification data “NA419” which corresponds to “NA419” and “12355”. Incidentally, a result of the search is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The digest data generator **626** has a function to generate summary data for the still image data file to be verified inputted by the input unit **621**. Incidentally, the generated digest data is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The decision unit **627** has a function to decide whether the summary data searched for by the searcher agrees with the summary data generated by the digest data generator **626**. Incidentally, a result of the decision is stored in the storage area in the RAM **403**, the magnetic disk **405**, the optical disk **407**, etc.

The output unit **628** outputs the result of the decision made by the decision unit **627**, e.g., to a device from which the still image data file was inputted by the input unit **621**.

The storage unit **630** stores therein moving image data. Further, the storage unit **630** stores therein summary data of each of still image data files each including a first area and a second area. Still image data encoded from image data is filed in the first area. Location data in moving image data and identification data of the moving image data are stored in the second area. Incidentally, the storage unit **630** stores therein summary data of each the still image data files in connection with location data of each of images in the moving image data.

The storage unit **630** specifically stores therein the original moving image data having the ID “NA419”. Further, the storage unit **630** stores therein digest data H1 and H2 through Hn for still image data a still image data that image data of the frame number 1 in the original moving data is encoded into and a still image data file including “NA419” and the frame number 1. Further, the digest data H1 and H2 through Hn is stored in connection with location data of each of the images in the moving image data. The digest data H1 and H2 through Hn may be specifically stored in the above order in the storage unit **630**. A pointer group indicating the digest data H1 and H2 through Hn may be stored in order of location data of each of the images in the moving image data, instead. Incidentally, the moving image data and the summary data are stored in the moving image management DB **500***a*.

FIG. **7** is an explanatory diagram which depicts an exemplary operation according to a signature algorithm. The signature device divides original data **701** into partial data blocks, calculates a hash collection of each of the partial data blocks and generates a hash data collection **702**. Then, the generated hash data collection **702** is made an object to be electronically signed. The signature device electronically signs the object to be signed. The signature device combines the hash data collection **702** with the electronic signature to form signature data **703** of the signature device.

The extractor device extracts partial data from the data that the signature device has put the signature data to so as to generate extracted data **704**. Then, the extractor device works similarly as the signature device so as to generate a hash data collection **705**. The extractor device makes the hash data collection **705** an object to be signed, electronically signs the object to be signed and combines the hash data collection **705** with the electronic signature to form signature data **706** of the extractor device.

The verifier device verifies integrity of the hash data collection **702** by means of the electronic signature of the signature device in the signature data **703** of the signature device. The verifier device similarly verifies integrity of the hash data collection **705** by means of the electronic signature of the extractor device in the signature data **706** of the extractor device. Then, the verifier device generates a hash data collection from disclosed partial data and verifies whether the generated hash data collection agrees with the hash data collection **705**. The verifier device finally compares the hash data collections of the signature device and the extractor device with each other so that it is known that a range **708** of the hash data of the extractor device has been extracted from a range **707** of the original data. If hash data of the extracted data **704** does not include hash data of the original data **701**, it is known that the partial data has been altered.

FIG. **8** is an explanatory diagram which depicts exemplary image types of compressed moving image data and their arrangement. A frame including compressed moving image data can be roughly classified into a moving image frame which can be independently played back and a predictive frame having differential data with respect to the moving image frame. The predictive frame will not be independently played back.

According to the MPEG standard, a moving frame which can be independently played back is called an I-picture, and a predictive frame is called a P- or B-picture. The I-picture keeps compressed image data corresponding to one frame. Further, the I-picture includes an IDR (Instantaneous Decoder Refresh) picture added anew according to the H.264/AVC standard. The I- and IDR pictures will be explained simply as an I-picture hereafter. Features of the respective pictures will be described later. The I-picture is a frame **801** in FIG. **8**. The P-pictures are frames **804** and **805**. The B-pictures are frames **802** and **803**.

The P- and B-pictures are each called an inter-frame predictive image, as well. The P-picture incorporates predictive error data, i.e., a difference with respect to a most lately decoded I- or P-picture which is made a reference image. The frame **804**, e.g., is converted into a frame which can be independently played back with reference to an image in the frame **801** which is an I-picture. The frame **805** is converted into a frame which can be independently played back by the moving image decoder **602** with reference to an image in the frame **804** which is a P-picture.

The converter **604** carries out a forward prediction by referring to a past frame in order to convert a P-picture in this way. The frame which is referred to is a latest I- or P-picture, and an earlier frame may be a reference frame according to H. 264/AVC.

The B-picture incorporates predictive error data, i.e., differences with respect to most lately decoded past and future I- or P-pictures which are made reference images. The frame **802**, e.g., is converted into a frame which can be independently played back with reference to images in the frame **801** and **804** which are I- and P-pictures, respectively, and so is the frame **803**.

The converter **604** carries out a bi-directional prediction by referring to past and future frames in order to convert a B-picture in this way. The frame which is referred to is a latest I- or P-picture for a B-picture similarly for a P-picture, and a frame one or more frames earlier or later may be a reference frame according to H. 264/AVC.

Calculate differences between a P- or B-picture and frames located in front and back in this way so as to reduce redundancy in a direction of time and to achieve a high data compression rate. Further, gather several images as depicted in FIG. **8** to form data such that a plurality of smallest units of moving image data called GOP (Group Of Pictures) is collected for compressed moving image data. Let GOP=9, e.g., in FIG. **8**. The GOP is a structure forming a unit which can be independently played back so that moving image data can be played back or edited from halfway.

Further, a function of an IDR picture will be explained. According to H. 264/AVC, as described earlier, a frame is referred to from a P- or B-picture beyond a latest I- or P-picture. It is thus unknown whether a playback starts from an I-picture. An IDR picture alleviates this problem. Upon receiving an IDR picture, the moving image decoder **602** clears a buffer that a reference frame is filed in, so as to guarantee that the playback starts from the IDR picture. As the reference is cleared, no frame can be referred to from the P- or B-picture beyond the IDR picture.

FIG. **9** is an explanatory diagram which depicts an exemplary case in which P- and B-pictures of compressed moving image data are converted into independent images. To begin with, suppose that data is filed in order of frames to be referred to in the moving image data as explanatorily indicated with a reference numeral **901**. The compressed moving image data is analyzed by the moving image decoder **602** for every frame, i.e., for each of frames **905**, **906** and **907**. A specific analytical example is given such that data in an MPEG format which has been entropy-encoded according to DCT (Discrete Cosine Transform) is decoded according to inverse DCT and analyzed for every frame.

As exemplarily depicted in FIG. **9**, the frames **905**, **906** and **907** are I-, P- and B-pictures, respectively. Then, the frames **905**-**907** are arranged in order of the frames **905**, **907** and **906** by the moving image decoder **602** so as to be in a chronological order as indicated with a reference numeral **902**.

Then, a process for converting the P- and B-pictures into independent images will be described. An explanatory diagram indicted with a reference numeral **903** depicts condition before a moving image frame is restored. The frame **905** which is an I-picture holds the entire image data. The frames **906** and **907** which are P- and B-pictures, respectively, each hold predictive error data which is a difference of the image data. The converter **604** converts the frames **906** and **907** into frames **906'** and **907'**, respectively, which can be played back after a moving image frame is restored as indicated with a reference numeral **904**.

Specifically, the converter **604** additionally writes the frame **906** which is a difference on the frame **905** being a base so as to generate the frame **906'**. Similarly, the converter **604** additionally writes the frame **907** which is a difference on the frames **905** and **906** being bases so as to generate the frame **907'**.

Further, the P- and B-pictures each have data of motion compensation in addition to the predictive error data, and grasp to what extent the image has moved in a particular range with respect to the I- and P-pictures being references. Incidentally, the moving image frame is restored after the frames are rearranged to be obtained in chronological order for convenience of explanation in FIG. **9**. Instead, the frames may be rearranged to be obtained in chronological order after the moving image frame is restored.

Then, a flow of data processing in the signature system of the embodiment will be explained by the use of an exemplary operation and an exemplary data structure. Further, what is supposed for the signature system **100** of the embodiment is defined before the flow of data processing is specifically explained. Terminals which access the signature system **100** of the embodiment are the upload terminal **202**, the playback/extraction terminal **203** and the verification terminal **204**. Three operators who operate the upload terminal **202**, the playback/extraction terminal **203** and the verification terminal **204** are a producer, an extractor and a verifier, respectively.

The producer manages and operates the picture recorder terminal **207** so as to register original image data. Then, the producer operates the upload terminal **202** so as to register the original image data in the signature device **205**. Specifically, if recording start and recording stop buttons with which the picture recorder terminal **207** is equipped are pressed, the picture recorder terminal **207** accepts instructions to start and stop recording pictures, respectively. Further, the extractor operates the upload terminal **202** so as to perform communication with the signature device **205**, and to issue instructions to register the original image data recorded by the picture recorder terminal **207**.

Further, the playback/extraction terminal **203** cuts off part of original image data stored and piled in the signature device **205**, and asks the signature device **205** to generate a cut off still image data file. Further, the verifier operates the verification terminal **204** so as to ask the signature device **205** to verify a disclosed cut off still image data file. Incidentally, suppose that the playback/extraction terminal **203** in the signature system **100** of the embodiment cuts off a data file of a single still image in the original moving image data.

FIG. **10** is an explanatory diagram which exemplarily depicts what is stored in a user data list. FIG. **10** depicts a producer user data list **1001**, an extractor user data list **1002** and a verifier user data list **1003** filed in the user management DB **502***a*.

The producer user data list **1001** includes two fields which are producer ID and password fields. Identification data for enabling the producer to be uniquely identified is filed in the producer ID field. A password for allowing the producer to log in the signature system **100** is filed in the password field. In FIG. **10**, e.g., "Kimura Ryuuichi: K19203" is filed in the producer ID field, and an encrypted password is filed in the password field.

Similarly, the extractor user data list **1002** includes two fields which are extractor ID and password fields. Identification data for enabling the extractor to be uniquely identified is filed in the extractor ID field. A password for allowing the extractor to log in the signature system **100** is filed in the password field.

Further, the verifier user data list **1003** includes two fields which are verifier ID and password fields. Identification data for enabling the verifier to be uniquely identified is filed in the verifier ID field. A password for allowing the verifier to log in the signature system **100** is filed in the password field.

The signature system **100** uploads and registers the original moving image data recorded by the picture recorder terminal **207** into the signature device **205** as instructed by the producer having logged in, and guarantees content of the original moving image data by putting a signature by means of the signature device **205**. Incidentally, as putting a signature while being unaware which part of the original moving image data is extracted, the signature system **100** extracts every one of the I-, P- and B-pictures. Further, the signature system **100** may extract only the I-picture carrying a piece of information which can be independently displayed.

Further, the signature system **100** partially extracts a data file of a single still image from the original moving image data that the signature device **205** has put a signature to as instructed by the extractor having logged in, and discloses the extracted file to the verification terminal **204** as a cut off still image data file.

Then, the signature system **100** verifies whether the disclosed cut off still image data file is guaranteed by the signature device **205** as instructed by the verifier having logged in. The signature system **100** verifies whether the disclosed cut off still image data file is part of the original moving image data that the signature device **205** has put a signature to, and verifies in addition whether the playback/extraction terminal **203** extracted the cut off still image data file after the extractor logged in. Incidentally, the signature device **205** traces the procedure of electronic signature described above in order to process the electronic signature.

FIG. **11** is an explanatory diagram which depicts an exemplary method for generating a signature to be put to original moving image data. The signature device **205** analyzes original moving image data **1101** which has been inputted to the signature generator **504** for every frame by means of the moving image decoder **602**, and arranges the analyzed frames in chronological order. Further, the signature device **205** stores the original moving image data **1101** in the storage unit **630**. Then, the signature device **205** transfers each of the frames to the converter **604** if the frame is a P- or B-picture, and to the still image encoder **605** if the frame is an I- or IDR picture.

The signature device **205** converts the frames transferred to the converter **604** into moving image frames which can be independently played back by means of the converter **604**. The converted moving image frames are specifically moving image frames F2 and F3 through Fn. Further, the conversion method was earlier described with reference to FIG. **9**. Further, the moving image frame which can be played back may be in a data format which is a same as that of an I- or IDR picture, or an uncompressed image format.

Then, the signature device **205** encodes the moving image frames which are I- and IDR-pictures transferred from the transfer unit **603** and the moving image frames converted by the converter **604** by means of the still image encoder **605**, and generates still images. The still images are specifically still images **31**, **32** and **33** through in.

Then, the signature device **205** extracts original metadata **1102** by means of the original metadata extractor **606**. Incidentally, an example of the extracted original metadata **1102** will be specifically described later with reference to FIG. **12**. Further, the signature device **205** encrypts part of the original metadata **1102** extracted for the still image J1 by means of the encryptor **607**, and writes the encrypted part into the still image J1. Then, the signature device **205** encrypts part of the original metadata **1102** extracted for the still image J2, and writes the encrypted part into the still image J2. The signature device **205** writes the extracted original metadata into each of the still images up to in. Incidentally, a method for writing the original metadata **1102** into the still images will be described later with reference to FIG. **12**.

After writing the original metadata **1102**, the signature device **205** generates digest data for each of the still images into which the original metadata **1102** is written by means of the digest data generator **611**. The signature device **205** specifically generates digest data H1 and H2 through Hn. Further, the signature device **205** generates digest data HA for the entire original moving image data **1101**.

Upon finishing generating all the digest data, the signature device **205** generates electronic signatures of the signature device **205** to be put to the digest data HA of the original moving image data **1101** and a collection of digest data of all the pictures by means of the electronic signature generator **612**. The signature device **205** sets the collection of the digest data and the electronic signatures of the signature device **205** generated for the collection together as signature data of the original moving image data.

The signature device **205** can use a one-way hash function to generate the digest data, and can use a public key cryptosystem RSA (Rivest Shamir Adleman) to generate the electronic signatures. The one-way hash function may incorporate algorithms called MD5, SHA-1 and SHA-256. According to SHA-256, e.g., digest data is generated in 256 bits (32 bytes) per one message.

If moving image data is recorded in 30 [fps] (fps: frame Per Second) for nearly one hour, e.g., frames as many as 30 [fps]×60 [seconds]×60 [minutes]=108000 are preserved. According to the SHA-256 algorithm, the digest data is as large as 108000 frames×32 [bytes]=nearly 3.5 [Mbytes] in size. The digest data and the signature generated according to the RSA cryptosystem form signature data as large as nearly 4 [Mbytes] in size together, so that the signature device **205** can achieve a guarantee of features of the original by preserving data not so large in size as the moving image data. The signature device **205** generates a signature to be put to original image data according to the above operations. What is specifically processed in FIG. **11** will be described later with reference to FIGS. **24** and **25**.

FIG. **12** is an explanatory diagram which depicts an exemplary still image data file that original metadata is added to. FIG. **12** depicts a state in which the original metadata **1102** is written into the still image data file J1 depicted in FIG. **11**. Suppose that the still image data file J1 is in a JPEG format. Data in two bytes formed by 0xFF and successive one byte is defined as a marker to give JPEG data and its structure a distinction in the JPEG format. A kind of marker "0xFFD8", e.g., indicates an SOI (Start Of Image) marker to indicate a start of the JPEG file. A marker "0xFFD9" indicates an EOI (End Of Image) marker to indicate an end of the JPEG file.

Further, there are APP0 through APP15 markers which can be used for various purposes. The APP0 through APP15 markers are given values "0xEFE0" through "0xFFEF". The APP1 marker is set as a location that the original metadata **1102** is written into according to the embodiment. The still image J1 includes an SOI marker, JPEG data, an APP1 marker and an EOI marker.

The original metadata **1102** written into the APP1 marker includes seven fields which are marker, data length, original moving image data ID, frame number, registration time, producer ID and signature device ID fields. In the marker field, "0xFFE1" which indicates APP1 is filed. In the data length field, the number of bytes from the data length field to the signature device ID field is filed. In the original moving image data ID field, an ID which can make the original moving image data **1101** uniquely identifiable is filed. In the frame number field, a frame location of a still image to be an object is filed.

In the registration time field, time when the original moving image data **1101** is registered is filed. Incidentally, the registration time field is obtained with reference to an internal clock in the signature device **205**. Incidentally, suppose that time is periodically calibrated on the internal clock in the signature device **205** and thus causes not so much error. The embodiment allows incorrect registration time, though.

The producer ID is an ID of a manager of the picture recorder terminal **207** who records the original moving image data **1101** by using the picture recorder terminal **207** and in addition registers the original moving image data **1101** in the signature device **205** by using the upload terminal **202**. The signature device ID is an ID which can make the signature device **205** uniquely identifiable. Incidentally, the signature system **100** may include a plurality of signature devices **205**. In that case, an ID which makes each of the plural signature devices **205** uniquely identifiable is filed in the signature device ID field.

In FIG. **12**, e.g., the original metadata **1102** related to the still image **31** is filed. The original metadata **1102** specifically indicates that the ID of the original moving image data **1101** is "NA419", that the still image J1 is of a first frame, and that the time of generation is "10:23:45 (HH:MM:SS), Aug. 11, 2010". Further, the original metadata **1102** indicates that the producer who produced the original moving image data **1101** is "Sato Taro: S20233" and that the ID of the signature device **205** is "http://server1.fj.com".

Further, the signature device **205** may run an encryption process by using an encryption key filed in the key management DB **501***a* in the signature device **205** so as to avoid leakage or alteration of the original metadata **1102**. Incidentally, a range to be encrypted includes the original moving image data ID field through the signature device ID field.

FIG. **13** is an explanatory diagram which exemplarily depicts what is stored in an original moving image data registration list **1301**. The original moving image data registration list **1301** is filed in the moving image management DB **500***a*. The original moving image data registration list **1301** includes three fields which are original moving image data ID, registration time and producer ID fields. The original moving image data ID, registration time and producer ID depicted in FIG. **12** are filed in the original moving image data ID, registration time and producer ID fields, respectively.

New entries are added to the original moving image data registration list **1301** each time new original moving image data is registered. In FIG. **13**, e.g., entries "NA419", "10:23:45 (HH:MM:SS), Aug. 11, 2010" and "Sato Taro: S20233" are in the original moving image data ID, registration time and producer ID fields, respectively.

FIG. **14** is an explanatory diagram which depicts an exemplary method for generating a cut off still image data file. The signature device **205** checks whether the original moving image data **1101** is unaltered. The signature device **205** specifically verifies data of a signature put to the original moving image data **1101** by means of the electronic signature verifier **622**. The signature device **205** takes a specific method such as to bring out the original moving image data **1101** stored in the storage unit **630** and verify the electronic signature added to the signature data.

If the verification is successful, the signature device **205** brings out the digest data HA of the entire original moving image data **1101** filed in the signature data. The signature device **205** compares the digest data HA with digest data for the entire original moving image data **1101** generated by the digest data generator **611** after bringing out the digest data HA, and checks whether the both digest data are the same.

The signature device **205** records digest data of the entire original moving image data **1101** in advance and uses the entire digest data for comparison in this way in order to detect alteration in the moving image data **1101**. The signature device **205** can thereby confirm the original more quickly than it does in a case where digest data of all the still images are recalculated for comparison.

Upon confirming the original, the signature device **205** is instructed with regard to a cut off location. If a frame corresponding to the cut off location is a P- or B-picture, the signature device **205** converts the frame into a moving image frame by means of the converter **604**, and further encodes the moving image frame. Suppose, e.g., that the signature device **205** is instructed to cut off a 12355th frame in FIG. **14**. At this time, the signature device **205** converts a B-picture of the 12355th frame into a moving image frame F12355 by means of the converter **604**, and further encodes the moving image frame F12355 and generates still image data J12355 by means of the still image encoder **605**.

After generating the still image data, the signature device **205** extracts the original metadata **1102** by means of the original metadata extractor **606**. Then, the signature device **205** encrypts and writes part of the generated original metadata **1102** into the still image data J12355. The still image data J12355 that the original metadata **1102** is written into is made a cut off still image data file J12355.

Then, the signature device **205** generates cut off metadata **1401** by means of the cut off metadata generator **610**. Incidentally, a specific example of the generated cut off metadata **1401** will be described later with reference to FIGS. **15**A and **15**B. Then, the signature device **205** encrypts part of the generated original metadata **1102** by means of the encryptor **607**. After the encryption, the signature device **205** generates digest data for a combination of the cut off still image data file J12355 and the cut off metadata **1401** by means of the digest data generator **611**. After the generation, the signature device **205** writes the generated digest data into a cut off log list **1501** which will be described later with reference to FIG. **15**, or into the cut off metadata **1401**. Finally, the signature device **205** writes the cut off metadata **1401** into the cut off still image data file J12355.

Then, two forms of the cut off still image data file to which the original metadata and the cut off metadata are added will be explained with reference to FIGS. **15**A and **15**B. FIG. **15**A illustrates a state in which the original metadata **1102** and the cut off metadata **1401** are written into the still image J12355 depicted in FIG. **14**, and the cut off log list **1501** is stored in the signature device **205**. Further, FIG. **15**B illustrates a state in which the cut off metadata **1401** that the digest data for the combination of the original metadata **1102** and the cut off still image data file is added to is written into the still image J12355 depicted in FIG. **14**.

FIG. **15**A is an explanatory diagram which depicts an example of the still image data file that the original metadata and the cut off metadata are added to. Incidentally, as the data to be filed in the original metadata **1102** was explained with reference to FIG. **12**, its explanation is omitted.

The cut off still image data file depicted in FIG. **15**A will be explained first. The still image data file J12355 includes an SOI marker, JPEG data being still image data, an APP1 marker, an APP2 marker and an EOI marker. The cut off metadata **1401** is filed in the APP2 marker.

The cut off metadata **1401** written into the APP2 marker includes four fields which are marker, data length, cut off time and extractor ID fields. In the marker field, "0xFFE2" which indicates APP2 is filed. In the data length field, the number of bytes from the data length field to the extractor ID field is filed. In the cut off time field, time when the cut off still image is generated is filed. In the extractor field, an ID of the user who generated the cut off still image is filed.

Further, the cut off log list **1501** filed in the moving image management DB **500***a* is a list that an entry is added to each time a cut off still image data file is generated. The cut off log list **1501** includes four fields which are original moving image data ID, cut off time, extractor ID and digest data of the cut off still image data file fields. In the original moving image data ID field, a same value as the value in the original moving image data ID field of the original metadata **1102** is filed. In the cut off time field, a same value as the cut off time of the cut off metadata **1401** is filed. In the extractor ID field, a same value as the value in the extractor ID field of the cut off metadata **1401** is filed. In the digest data of the cut off still image data file field, digest data generated from the cut off still image is filed.

Further, the signature device **205** may perform encryption by using an encryption key filed in the key management DB **501***a* in the signature device **205** so as to avoid leakage or alteration of the cut off metadata **1401**. Incidentally, a range to be encrypted includes the cut off time through extractor ID fields.

Further, a range covered by the digest data of the cut off still image data file is a digest range 1 which covers the entire still image J12355 depicted in FIG. **15**A. Further, the range covered by the digest data of the cut off still image data file may be a digest range 2 which covers the entire still image J12355 depicted in FIG. **15**A. The digest range 2 specifically covers the original moving image data ID field in the original metadata **1102** through the extractor ID field in the cut off metadata **1401**.

Why the range covered by the digest data is limited to the digest range 2 is, at first, that authenticity can be confirmed with regard to the cut off still image data file excluding the cut off metadata **1401** depending upon the signature data put to the original moving image data **1101**. Thus, it is enough for the digest data of the cut off still image data file to cover the cut off metadata **1401**. If the digest range covers only the cut off metadata **1401**, however, the cut off metadata **1401** can be exchanged for different cut off metadata **1401**.

Thus, if the range covered by the digest data includes at least the original moving image data ID field and the frame number field, digest data which is peculiar to the cut off still image data file can be generated in the digest range 2. Incidentally, a period of time for data processing according to the one-way hash function which generates digest data can be rendered shorter as an inputted byte pattern is shorter. The signature device **205** can thereby shorten a period of time for generating digest data by narrowing the range covered by the digest data while keeping the cut off still image data file including the cut off metadata **1401** from being altered or exchanged by a third party.

Incidentally, cut off meta data **1401** related to the still image J12355 having been cut off is filed as depicted in FIG. **15**A. The cut off metadata **1401** specifically indicates that the time when the still image was cut off is 15A3:32 (HH:MM:SS), Aug. 13, 2010, and that the ID of the extractor who cut off the still image is "Suzuki Minoru: S13256". Further, it is indicated that the digest data field in the cut off still image data file in the cut off log list **1501** indicates "FD81920B2".

FIG. **15**B is an explanatory diagram which depicts another example of the cut off still image data file that the original metadata and the cut off metadata are added to. Incidentally, differences from what is depicted in FIG. **15**A will be explained with reference to FIG. **15**B. The cut off metadata **1401** includes the digest data field of the cut off still image data file in the cut off still image data file depicted in FIG. **15**B. As what is stored in the digest data field of the cut off still image data file, digest data generated for a combination of the cut off still image data file and data peculiar to the signature device **205** is filed. As the digest data of the cut off still image data file is opened in FIG. **15**B, the signature device **205** can keep the digest data from being forged by combining the digest range and the peculiar data that only the signature device **205** knows so as to generate the digest data.

The signature device **205** can generate digest data for the digest range and the peculiar data within the signature device **205** in this way, so as to keep the cut off still image data file from being altered or exchanged by a third party. Incidentally, it is preferable for the peculiar data of the signature device **205** to be filed in the signature device data management TB **503** in advance in such a way that no third person can peruse the peculiar data. Although the signature device ID can be used for the peculiar data of the signature device **205**, it is preferable to have another ID as the signature device ID is opened as included in the original metadata **1102**.

Further, the signature device **205** generates digest data excluding a portion of the digest data field in the cut off still image data file with regard to the digest range 1 of the digest data in the cut off still image data file. On the other hand, the signature device **205** may fix the digest data field in the cut off still image data file in size and generate the digest data in which every bit in the digest data field is given a value 0.

FIG. **16** is an explanatory diagram which depicts an exemplary method for verifying a signature put to the cut off still image data file. To begin with, the signature device **205** extracts the original metadata **1102** and the cut off metadata **1401** from the cut off still image data file to be verified according to the JPEG format by means of the metadata extractor **623**. Incidentally, if some of the fields of the original metadata **1102** and the cut off metadata **1401** are encrypted, the signature device **205** decodes the encrypted fields by means of the decoder **624**.

Then, the signature device **205** generates digest data from the original moving image data **1101** stored in the storage unit **630** by means of the digest data generator **626**. Then, the signature device **205** brings out and compares the signature data of both the generated digest data and the original moving image data **1101**, and decides whether the both signature data agree with each other.

If the both signature data agree with each other, the signature device **205** verifies part of the original of the cut off still image data file. The signature device **205** specifically generates digest data from the cut off still image data file except for the cut off metadata **1401**. Incidentally, the signature device **205** generates digest data for the original metadata **1102** included in the digest data of the cut off still image data file being kept encrypted with an encryption key. Why the signature device **205** generates the digest data in a state of being encrypted is that digest data was generated in a state of being encrypted when the signature put to the original moving image data **1101** was generated. Thus, the signature device **205** processes verification in a state of being encrypted for checking whether data is altered in the verification process, as well.

Then, the signature device **205** searches and brings out the digest data filed in the signature data of the original moving image data **1101** with respect to the frame number filed in the original metadata **1102**. In FIG. **16**, e.g., as the frame number equal to 12355 is recorded in the original metadata, the signature device **205** brings out the 12355th digest data filed in the signature data of the original moving image data. After bringing out that, the signature device **205** compares the digest data generated by the electronic signature verifier **622** with the brought out digest data and decides whether the both digest data agree with each other.

If the both digest data agree with each other, the signature device **205** checks whether the cut off metadata is unaltered. The signature device **205** specifically generates digest data of the original metadata and the cut off still image data file including the cut off metadata. Incidentally, the signature device **205** generates the digest data by including the cut off metadata encrypted with an encryption key and the peculiar data of the signature device **205**. After generating the digest data, the signature device **205** compares the generated digest data with the digest data filed in the cut off metadata and decides whether the both digest data agree with each other. If the both digest data agree with each other, the signature device **205** notifies the verification terminal **204** of success in the verification. Then, exemplary screens displayed on the playback/extraction terminal **203** and the verification terminal **204** will be explained with reference to FIGS. **17**-**21**.

FIG. **17** is an explanatory diagram which depicts an exemplary screen that a list of the original moving image data **1101** is displayed on. The playback/extraction terminal **203** can choose original moving image data to be cut off if a checkbox (CHECK) is pressed. If the extractor presses an OK button (OKRUN), a request for a cut off process is sent to the signature device **205**.

FIG. **18** is an explanatory diagram which depicts an exemplary screen that a cut off still image data file is made on. If the extractor presses a playback button (PREVIEW), the playback/extraction terminal **203** plays the original moving image data back. The extractor looks at and specifies a cut off location while the playback is going on, so as to enable the playback/extraction terminal **203** to perform a cut off operation.

A specific method for the cut off operation is as follows. Shift a pointer to a location where the cut off operation is done on a seekbar (SEEKBAR) and press a cut off button (EXTRACTSET) upon the pointer reaching the location where the cut off operation is done, so that the playback/extraction terminal **203** sets the cut off location. The cut off location (CUTPOINT) is specified owing to the above operation. Press a run button (EXTRACTRUN) so that the playback/extraction terminal **203** sends cut off location data to the signature device **205**.

FIG. **19** is an explanatory diagram which depicts an exemplary screen that a cut off still image data file to be verified is chosen on. If the extractor presses a reference button (REFERENCE), the playback/extraction terminal **203** displays a cut off still image data file preserved in the playback/extraction terminal **203** on a file management window. After the extractor chooses a cut off still image data file to be verified and presses a signature verification button (VERIFYRUN), the playback/extraction terminal **203** sends the chosen cut off still image data file to the verification terminal **204**.

FIG. **20** is an explanatory diagram which depicts an exemplary screen that a result of the verification of the cut off still image data file is displayed on. The verification terminal **204** can demonstrate to the verifier a result such that the cut off still image data file is the still image data file formed by extracted part of the original moving image data and is unaltered after the extraction by displaying a result of the verification (VERIFY1). Further, the verification terminal **204** can display the cut off location indicating which part of the original moving image data is extracted (VERIFY2).

Further, press a certificate check button so that the verification terminal **204** can display the electronic signature data of the original moving image data and who made the original moving image data (VERIFY3).

Further, press a property data check button so that the verification terminal **204** displays a result such that the original metadata **1102** and the cut off metadata having been unaltered are verified (VERIFY4). An exemplary screen that property data is displayed on will be described later with reference to FIG. **21**.

FIG. **21** is an explanatory diagram which depicts an exemplary screen that the property data of the cut off still image data file is displayed on. Press the property data check button so that the verification terminal **204** displays a screen for resultant signature verification of the cut off still image data file. The verification terminal **204** specifically displays content of the original metadata **1102** and the cut off metadata **1401**. The verifier checks the screen for resultant signature verification of the cut off still image data file in this way, so that the verifier can confirm that the original moving image data is made by the signature device **205** and is unaltered.

The signature system **100** runs five processes for generating original moving image data, generating a signature, verifying signature data, generating a cut off still image data file and verifying the cut off still image data file by using the devices and functions described above. The respective processes will be explained with reference to flowcharts depicted in FIGS. **22** to **29**B. Further, a dashed arrow indicates data sending and receiving among the plural devices in each of the flowcharts.

In the process for generating original moving image data, the signature system **100** runs a process for generating a signature to be put to the original moving image data, and its breakdown includes processes for decoding a moving image of the original moving image data, generating an independent frame and generating an electronic signature. In the process for verifying signature data of the original moving image data, the signature system **100** runs a process for verifying an electronic signature to be put to the original moving image data. In the process for generating a cut off still image data file, the signature system **100** runs a process for verifying a signature to be put to the original moving image data and generating an independent frame. In the process for verifying a cut off still image data file, the signature system **100** runs a process for verifying signature data of the original moving image data. Further, the processes for generating an electronic signature and verifying an electronic signature incorporate processes for sending and receiving data that an electronic signature is put to and verifying a receiver device depicted in FIG. **23** to be run after a process for registering a public key of an electronic signature in advance as described later with reference to FIG. **22**.

FIG. **22** is a flowchart which depicts an exemplary process for registering a public key to be used for electronic signature. FIG. **22** depicts a process in which a public key is registered in between the transmitter and the authenticator device **201**. The transmitter of the electronic signature of the embodiment is the signature device **205**.

To begin with, the transmitter generates a pair of keys (secret and public keys) (operation S**2201**). Then, the transmitter inputs request data for certificate issuance (operation S**2202**). The input data is related to the signature device **205**. Upon finishing inputting the request data for certificate issuance, the transmitter sends the inputted request data for certificate issuance and the public key to the authenticator device **201** (operation S**2203**).

The authenticator device **201** receives the request data for certificate issuance and the public key on the communicator **304** (operation S**2204**). The certificate issuer **302** in the authenticator device **201** generates a public key certificate including the public key (operation S**2205**), and piles the generated public key certificate on the public key DB **301** (operation S**2206**). Then, the certificate issuer **302** controls the communicator **304** so as to send the issued public key certificate to the transmitter having sent the request data for certificate issuance via the network **206** (operation S**2207**).

Upon receiving the public key certificate (operation S**2208**), the transmitter piles the secret key generated by the operation **2201** and the public key certificate issued by the authenticator device **201** on the storage device that the transmitter itself has (operation S**2209**), and finishes the process. The signature device **205** holds the secret key and the public key certificate in the key management DB **501***a* used as a storage area.

FIG. **23** is a flowchart which depicts examples of a process for sending and receiving data that an electronic signature is put to and a verification process to be run by the receiver. FIG. **23** depicts the process for sending and receiving data that an electronic signature is put to between the transmitter and the receiver, and the process for verifying the electronic signature in between the receiver and the authenticator device **201**. The transmitter and the receiver of the embodiment are each the signature device **205**.

To begin with, the transmitter encrypts summary data (hash data) which is an object to be signed with the secret key stored in the storage area (operation S**2301**). Data generated through the encryption forms an electronic signature. Then, the transmitter sends the object to be signed, the electronic signature and the public key certificate similarly stored in the storage area to the receiver (operation S**2302**).

The receiver receives the object to be signed, the electronic signature and the public key certificate (operation S**2303**), and sends the public key certificate to the authenticator device **201** (operation S**2304**) in order to check the term of validity, data of losing validity, etc. Suppose that the authenticator device **201** of the embodiment supports a series of functions to issue and verify a certificate. Then, the authenticator device **201** receives the public key certificate (operation S**2305**), verifies validity (operation S**2306**) and sends a result of the verification to the receiver (operation S**2307**).

The receiver receives the result of the verification (operation S**2308**) and checks whether the result of the verification proves validity (operation S**2309**). If the result of the verification does not prove validity (operation S**2309**: No), the receiver decides that no fact that the received object to be signed is unaltered can be proved (operation S**2313**) and finishes the process. If the result of the verification proves validity (operation S**2309**: Yes), the receiver generates summary data (hash data) of the received object to be signed (operation S**2310**), and further decodes the received electronic signature with the public key (operation S**2311**). Then, the receiver checks whether the generated summary data of the object to be signed agrees with a value obtained from the electronic signature decoded with the public key (operation S**2312**).

If they do not agree with each other (operation S**2312**: No), the receiver shifts to an operation S**2313** and finishes the process. If they agree with each other (operation S**2312**:

Yes), the receiver decides that the fact that the received object to be signed is unaltered can be proved (operation S**2314**), holds the object to be signed (operation S**2315**) and finishes the process. Upon going through the operation S**2313**, the receiver may run a notification process for indicating that the electronic signature was not proven on the operation terminal of the receiver, e.g., the playback/extraction terminal **203** or the verification terminal **204**.

FIG. **24** is a flowchart which depicts an exemplary process for generating original moving image data. The picture recorder terminal **207** generates original moving image data (operation S**2401**). The picture recorder terminal **207** decides whether the picture recorder terminal **207** has accepted a request for a close of recording after generating the original moving image data (operation S**2402**). Upon accepting no request for a close of recording (operation S**2402**: No), the picture recorder terminal **207** shifts to the process of the operation S**2401** and continues generating the original moving image data. Upon accepting a request for a close of recording (operation S**2402**: Yes), the picture recorder terminal **207** sends the completely generated original moving image data to the upload terminal **202** (operation S**2403**) and finishes the process for generating original moving image data.

The upload terminal **202** receives the original moving image data (operation S**2404**). The upload terminal **202** stores the received original moving image data in the upload terminal **202** (operation S**2405**), and sends a request to the signature device **205** for login of a producer (operation S**2406**). At this time, the upload terminal **202** accepts user data such as an ID and a password of the producer as an input from the producer included in data for logging the producer in on the signature device **205**. The upload terminal **202** sends the user data and the original moving image data with the login request to the signature device **205**. Incidentally, the upload terminal **202** waits for a reply to come from the signature device **205** after the login.

Upon receiving the request for login from the upload terminal **202**, the signature device **205** certifies the producer whose data is in the user data (operation S**2407**). A specific method for certifying the producer is as follows. If the producer user data list **1001** includes a record which agrees with the received user data, the signature device **205** certifies the producer who requested to log in as the right producer. After certifying the producer, the signature device **205** decides whether the certification resultantly indicates the right producer (operation S**2408**).

If the right producer is indicated (operation S**2408**: Yes), the signature device **205** runs a process for generating a signature to be put to the original moving image data (operation S**2409**). The process for generating a signature to be put to the original moving image data will be described later in detail with reference to FIG. **25**. After running that process, the signature device **205** files the original moving image data and the signature data in the moving image management DB **500**a via the moving image management TB **500**b (operation S**2410**). After filing them, the signature device **205** sends a result of a registration process to the upload terminal **202** (operation S**2411**). Unless the right producer is indicated (operation S**2408**: No), the signature device **205** notifies the upload terminal **202** of an error (operation S**2412**).

Upon receiving what is sent from the signature device **205**, the upload terminal **202** decides whether what is received is a result of the registration process (operation S**2413**). If it is a result of the registration process (operation S**2413**: Yes), the upload terminal **202** displays the result of the registration process (operation S**2414**) and finishes the process for generating the original moving image data. Unless it is a result of the registration process (operation S**2413**: No), the upload terminal **202** displays the error notification (operation S**2415**) and finishes the process for generating the original moving image data.

FIGS. **25**A and **25**B are flowcharts which depict an exemplary process for generating a signature to be put to original moving image data. To begin with, see the flowchart depicted in FIG. **25**A. The signature device **205** allocates a new original moving image data ID and shelters the ID into a storage area (operation S**2501**). After sheltering it, the signature device **205** obtains registration time and shelters the registration time into the storage area (operation S**2502**). Then, the signature device **205** sets the original moving image data ID, the registration time and the producer ID as a new record in the original moving image data registration list **1301** (operation S**2503**).

After setting them, the signature device **205** obtains a signature device ID and shelters the signature device ID into the storage area (operation S**2504**). After sheltering it, the signature device **205** runs a moving image decoding process for decoding the original moving image data (operation S**2505**). Details of the moving image decoding process are indicated by the reference numerals **901** and **902** in FIG. **9** described earlier. The signature device **205** specifically runs the decoding process in accordance with a format of the original moving image data, decides which one of the I-, P- and B-pictures the respective frames are, and rearranges the frames not chronologically arranged so that the frames can be chronologically obtained.

After being ready to obtain data from the original moving image data frame by frame as the operation S**2505**, the signature device **205** obtains a front frame (operation S**2506**). After obtaining it, the signature device **205** shifts to a process of an operation S**2507**.

Then, see the flowchart depicted in FIG. **25**B. The signature device **205** runs a process for generating an independent frame for the obtained frame (operation S**2507**). The process for generating an independent frame will be described later with reference to FIG. **26**. After running the process for generating an independent frame, the signature device **205** encodes the outputted independent frame into still image data (operation S**2508**). The signature device **205** specifically does JPEG encoding for each of I-, P- and B-pictures to be encoded into JPEG image formats so as to generate still image data.

After encoding the pictures, the signature device **205** extracts original metadata from the original moving image data (operation S**2509**), and encrypts the original metadata with a shared key of the signature device **205** (operation S**2510**). Incidentally, a range to be encrypted is the range depicted in FIG. **12**. After the encryption, the signature device **205** writes the encoded still image data and the original metadata into a new still image data file to be generated (operation S**2511**).

Then, the signature device **205** generates digest data of the still image data file (operation S**2512**). After generating the digest data, the signature device **205** decides whether the obtained frame is a last frame (operation S**2513**). If there is a successive frame (operation S**2513**: No), the signature device **205** obtains a next frame (operation S**2514**) and shifts to the process of the operation S**2507**.

If the obtained frame is a last frame (operation S**2513**: Yes), the signature device **205** generates digest data for the entire original moving image data (operation S**2515**). After generating the digest data, the signature device **205** runs a process for generating an electronic signature of the signature device **205** for the original moving image data and a collection of digest data of all still image data files (operation S**2516**), and finishes the process for generating a signature to be put to the original moving image data.

FIG. **26** is a flowchart which depicts a process for generating an independent frame. The signature device **205** checks whether an obtained frame is an I-picture (operation S**2601**). The I-picture mentioned here includes an IDR-picture.

If it is an I-picture (operation S**2601**: Yes), the signature device **205** converts the obtained frame into an independent frame (operation S**2607**). If the obtained frame is a P- or B-picture (operation S**2601**: No), the signature device **205** obtains a frame which is a preceding I- or P-picture (operation S**2602**). The term preceding means a direction towards the past on a time axis.

Then, the signature device **205** checks whether the obtained frame is a P-picture (operation S**2603**). If the obtained frame is a P-picture (operation S**2603**: Yes), the signature device **205** converts the preceding frame and the obtained frame into an independent frame (operation S**2606**). If the obtained frame is a B-picture (operation S**2603**: No), the signature device **205** obtains a frame which is a succeeding I- or P-picture (operation S**2604**). After obtaining it, the signature device **205** converts the preceding frame, the succeeding frame and the obtained frame into an independent frame (operation S**2605**).

After processing the operation S**2607**, S**2606** or S**2605**, the signature device **205** outputs the independent frame (operation S**2608**) and finishes the process. Incidentally, a specific example of the conversion of the operation S**2607**, S**2606** or S**2605** is the process going on from what is indicated by the reference numeral **903** to what is indicated by the reference numeral **904** as earlier described with reference to FIG. **9**.

FIGS. **27**A, **27**B, **27**C and **27**D form a flowchart which depicts an exemplary process for generating a cut off still image data file. See the flowchart depicted in FIG. **27**A. The playback/extraction terminal **203** sends a request to the signature device **205** for login of an extractor (operation S**2701**). After sending the request for login, the playback/extraction terminal **203** waits for a reply to come from the signature device **205**.

Upon receiving the request for login from the playback/extraction terminal **203**, the signature device **205** certifies the extractor whose data is in the user data (operation S**2702**). A specific method for certifying the extractor as the operation S**2702** is as follows. If the extractor user data list **1002** includes a record which agrees with the received user data, the signature device **205** certifies the extractor who requested to log in as the right extractor.

After certifying the extractor, the signature device **205** decides whether the certification resultantly indicates the right extractor (operation S**2703**). If the right extractor is indicated (operation S**2703**: Yes), the signature device **205** sends the original moving image data registration list **1301** to the playback/extraction terminal **203** (operation S**2704**). Unless the right extractor is indicated (operation S**2703**: No), the signature device **205** notifies the playback/extraction terminal **203** of an error (operation S**2705**) and finishes the process for generating a cut off still image data file.

Upon receiving what is sent from the signature device **205**, the playback/extraction terminal **203** decides whether what is received from the signature device **205** is the original moving image data registration list **1301** (operation S**2706**). If it is the original moving image data registration list **1301** (operation S**2706**: Yes), the playback/extraction terminal **203** displays the original moving image data registration list **1301** (operation S**2707**), and accepts a choice of original moving image data to be extracted (operation S**2708**). After the extractor's choice, the playback/extraction terminal **203** sends a request to the signature device **205** for a process for cutting off the chosen moving image data (operation S**2709**) and waits for a reply to come from the signature device **205**.

Unless what is received is the original moving image data registration list **1301** (operation S**2706**: No), the playback/extraction terminal **203** displays an error notice (operation S**2710**) and finishes the process for generating a cut off still image data file. Further, the signature device **205** receives a request for a cut off process (operation S**2711**) and shifts to a process of an operation S**2712**.

Then, see the flowchart depicted in FIG. **27**B. The signature device **205** brings out the original moving image data and signature data to be extracted filed in the moving image management DB **500***a* (operation S**2712**) and runs a process for verifying signature data of the original moving image data (operation S**2713**). After running that process, the signature device **205** decides whether a result of the verification proves successful (operation S**2714**). If it proves successful (operation S**2714**: Yes), the signature device **205** sends instructions to continue the cut off process to the playback/extraction terminal **203** (operation S**2715**). If it proves unsuccessful (operation S**2714**: No), the signature device **205** notifies the playback/extraction terminal **203** of an error (operation S**2716**).

Upon receiving what is sent from the signature device **205**, the playback/extraction terminal **203** decides whether the instructions to continue the cut off process are received (operation S**2717**). Upon receiving the instructions to continue the cut off process (operation S**2717**: Yes), the playback/extraction terminal **203** accepts an appointed cut off location (operation S**2718**). After the extractor appoints the cut off location, the playback/extraction terminal **203** sends cut off location data to the signature device **205** (operation S**2719**). Incidentally, the playback/extraction terminal **203** waits for a reply to come from the signature device **205** after sending the cut off location data. Unless the instructions to continue the cut off process are received (operation S**2717**: No), the playback/extraction terminal **203** displays an error notice (operation S**2720**) and finishes the process for generating a cut off still image data file. Further, the signature device **205** receives the cut off location data (operation S**2721**) and shifts to a process of an operation S**2722**.

Then, see the flowchart depicted in FIG. **27**C. The signature device **205** runs a process for generating an independent frame of a frame on the cut off location (operation S**2722**). After running that, the signature device **205** encodes the outputted independent frame into still image data (operation S**2723**). After encoding that, the signature device **205** extracts original metadata corresponding to the cut off location from the original moving image data (operation S**2724**), and encrypts the original metadata corresponding to the cut off location with the shared key of the signature device **205** (operation S**2725**). After encrypting that, the signature device **205** writes the still image data and the original metadata into a file to be the cut off still image data file (operation S**2726**).

After writing that, the signature device **205** obtains cut off time and shelters it into the storage area (operation S**2727**). Then, the signature device **205** obtains the extractor ID and shelters it into the storage area (operation S**2728**). The signature device **205** generates cut off metadata from the obtained cut off time and extractor ID (operation S**2729**) and shifts to a process of an operation S**2730**.

Finally, see the flowchart depicted in FIG. **27**D. The signature device **205** encrypts the cut off metadata with the shared key of the signature device **205** (operation S**2730**) and generates digest data of the cut off still image data file (operation S**2731**). Incidentally, the digest data generated by the operation S**2731** is generated for a combination of the cut off still image data file and the peculiar data of the signature device **205**. Further, a range in which the digest data is generated by the operation S**2731** may be the entire cut off still image data file which is the digest range 1 as described with reference to FIG. **15**. Further, the range in which the digest data is generated may be the original image data ID through extractor ID fields which is the digest range 2.

After generating that, the signature device **205** writes the cut off metadata into the still image data file (operation S**2732**) and files it into the moving image management DB **500***a* as a cut off still image data file (operation S**2733**). After filing that, the signature device **205** sends the cut off still image data file to the playback/extraction terminal **203** (operation S**2734**) and finishes the process for generating the cut off still image data file.

The playback/extraction terminal **203** receives the cut off still image data file (operation S**2735**), stores the received cut off still image data file (operation S**2736**) and finishes the process for generating the cut off still image data file.

As described above, the signature device **205** entirely takes charge of the cut off processing function so that the playback/extraction terminal **203** just accepts instructions about a location of extraction, and that the cut off process can be run while no encryption key kept by the signature device **205** is taken into account.

FIG. **28** is a flowchart which depicts an exemplary process for verifying signature data of original moving image data. The signature device **205** runs a process for verifying signature data of original moving image data (operation S**2801**). After running the process, the signature device **205** decides whether the verification resultantly proves successful (operation S**2802**). If the verification resultantly proves successful (operation S**2802**: Yes), the signature device **205** generates digest data for the entire original moving image data (operation S**2803**). After generating that, the signature device **205** compares the generated digest data with the digest data for the entire original moving image data filed in the signature data (operation S**2804**). After comparing them, the signature device **205** decides whether the comparison resultantly proves that the both digest data agree with each other (operation S**2805**).

If the comparison resultantly proves that the both digest data agree with each other (operation S**2805**: Yes), the signature device **205** outputs a result of the verification as being successful (operation S**2806**) and finishes the process for verifying the signature data of the original moving image data. Unless the verification resultantly proves successful (operation S**2802**: No) or unless the comparison resultantly proves that the both digest data agree with each other (operation S**2805**: No), the signature device **205** outputs a result of the verification as being unsuccessful (operation S**2807**) and finishes the process for verifying the signature data of the original moving image data.

FIGS. **29**A and **29**B form a flowchart which depicts an exemplary process for verifying a cut off still image data file. To begin with, see the flowchart depicted in FIG. **29**A. The playback/extraction terminal **203** brings out a cut off still image data file (operation S**2901**). After bringing out that, the playback/extraction terminal **203** sends the cut off still image data file having been brought out to the verification terminal **204** (operation S**2902**) and finishes the process for verifying the cut off still image data file.

The verification terminal **204** receives the cut off still image data file (operation S**2903**) and sends a request to the signature device **205** for login of a verifier (operation S**2904**). After sending that, the verification terminal **204** waits for a reply to come from the signature device **205**.

Upon receiving the request for login from the verification terminal **204**, the signature device **205** certifies the verifier whose data is in the user data (operation S**2905**). A specific method for certifying the verifier as the operation **2905** is as follows. If the verifier user data list **1003** includes a record which agrees with the received user data, the signature device **205** certifies the verifier who requested to log in as the right verifier.

After certifying the verifier, the signature device **205** decides whether the certification indicates the right verifier (operation S**2906**). If the right verifier is indicated (operation S**2906**: Yes), the signature device **205** extracts original metadata and cut off metadata from the cut off still image data file (operation S**2907**). A specific method for extracting that is as follows. If the cut off still image data file is in a JPEG format, the signature device **205** detects a marker in the cut off still image data file.

If the type of the detected marker is “0xFFE1” which indicates APP1, the signature device **205** extracts original metadata up to a data pattern indicated by the successive data length field. Further, if the type of the detected marker is “0xFFE2” which indicates APP2, the signature device **205** extracts cut off original metadata up to the data pattern indicated by the successive data length field. Further, in case of another marker, the signature device **205** skips the data pattern indicated by the successive data length field and detects a next marker.

After extracting the original metadata and the cut off metadata, the signature device **205** decodes encrypted fields in the original metadata and the cut off metadata with the shared key of the signature device **205** (operation S**2908**). After decoding them, the signature device **205** searches the original moving image data and the signature data filed in the moving image management DB **500***a* with respect to the original moving image data ID field in the original metadata (operation S**2909**) and runs a process for verifying the signature data of the original moving image data (operation S**2910**). After running that process, the signature device **205** decides whether a result of the verification proves successful (operation S**2911**). If it proves successful (operation S**2911**: Yes), the signature device **205** shifts to a process of an operation S**2913**.

Unless the right verifier is indicated (operation S**2906**: No) or unless the verification proves successful (operation S**2911**: No), the signature device **205** notifies the verification terminal **204** of an error (operation S**2912**) and finishes the process for verifying the cut off still image data file.

Then, see the flowchart depicted in FIG. **29**B. The signature device **205** generates digest data of the cut off still image data file excluding the cut off metadata (operation S**2913**). After generating that, the signature device **205** searches the digest data in the signature data with respect to a value in the frame number field in the original metadata (operation S**2914**).

After searching that, the signature device **205** compares the generated digest data with digest data having been searched for and found out (operation S**2915**). After comparing the both digest data, the signature device **205** decides whether the comparison resultantly proves that the both digest data agree with each other (operation S2916). If the comparison resultantly proves that the both digest data agree with each other (operation S2916: Yes), the signature device 205 generates digest data of the cut off still image data file (operation S2917). Incidentally, the digest data generated by the operation S2917 is generated by means of data in which data such that the cut off still image data file includes the peculiar data of the signature device 205 is included.

After generating that, the signature device 205 compares the generated digest data with the digest data of the cut off still image data file in the cut off metadata (operation S2918). After comparing the both digest data, the signature device 205 decides whether the comparison resultantly proves that the both digest data agree with each other (operation S2919). If the comparison resultantly proves that the both digest data agree with each other (operation S2919: Yes), the signature device 205 sends a result of the verification to the verification terminal 204 (operation S2920) and finishes the process for verifying the cut off still image data file. Unless the comparison resultantly proves that the both digest data agree with each other (operation S2919: No), the signature device 205 notifies the verification terminal 204 of an error (operation S2921) and finishes the process for verifying the cut off still image data file.

Upon receiving what is sent from the signature device 205, the verification terminal 204 decides whether what is received is a result of the verification of the cut off still image data file (operation S2922). Upon receiving a result of the verification of the cut off still image data file (operation S2922: Yes), the verification terminal 204 displays the result of the verification of the cut off still image data file (operation S2923) and finishes the process for verifying the cut off still image data file. Upon receiving no result of the verification of the cut off still image data file (operation S2922: No), the verification terminal 204 displays an error notice (operation S2924) and finishes the process for verifying the cut off still image data file.

According to the signature device, the method for signature and the program for signature described above, write original metadata for identifying image data into image data generated from moving image data so as to put a signature to the image data. The signature device can thereby generate image data which facilitates identification of signature data to be related to confirmation of the original. As the original metadata is included in an object to be signed, the signature device can detect an alteration if any and can easily identify the signature data by using a key for searching the moving image data and the signature data included in the original metadata in condition of no alteration.

Further, since a signature device has to have a plurality of tables for managing moving image data and signature data together, an existing signature device suffers from increased operation cost and a huge amount of data. The signature device of the embodiment does not have to manage moving image data and signature data together as data to be used for searching the signature data is included in the image data to be opened, and can thereby reduce the operation cost. Further, the ordinarily known signature device takes time for searching a huge amount of data. The signature device of the embodiment can reduce an amount of data to be held, though, and can reduce time for searching the data.

Further, the signature device may write cut off metadata to be data in time of a cut off operation into a cut off still image data file, so as to generate digest data for the cut off still image data file including the cut off metadata. The signature device can thereby keep the data in time of the cut off operation unaltered.

Further, the signature device may generate digest data for a combination of the cut off still image data file that the cut off metadata is written into and peculiar data of the signature device, and include the digest data in the cut off still image data file. The signature device thereby does not have to store in itself the digest data of the cut off still image data file including the cut off metadata, and can reduce the amount of data in the signature device.

Further, the signature device may generate digest data for a combination of original metadata of the cut off still image data file, the cut off metadata and peculiar data of the signature device, and include the digest data in the cut off still image data file. The signature device can thereby reduce time for generation of the digest data which protects the cut off still image data file from alteration, and can reduce time for signature generation and signature verification.

Further, the signature device may decide in a group of stored summary data whether summary data such that a combination of moving image data and location data of image data in the moving image data corresponds to data extracted from image data to be verified agrees with summary data of the image data to be verified. The signature device can thereby easily identify corresponding summary data from a huge group of summary data by using original metadata written into the image data to be verified.

Further, the moving image data stored in the signature device may be compressed moving image data. Further, the compressed moving image data may be inter-frame compressed moving images. Further, data made open to the public is a still image data file according to the embodiment, and may be moving image data which is part of moving image data instead. The signature device may cut off moving image data from original moving image data, e.g., on a GOP-by-GOP basis, and may write cut off metadata into the cut off moving image data so as to open it to the public.

Incidentally, run a program for signature prepared in advance on a computer such as a personal computer or a workstation so that the method for signature explained according to the embodiment can be implemented. The program for signature is recorded on a computer-readable recording medium such as a hard disk, a flexible disk, a CD-ROM, an MO or a DVD, and is read from the recording medium by the computer so as to be run. Further, the program for signature may be distributed through a network such as the Internet.

All examples and conditional language recited herein are intended for pedagogical purposes to aid the reader in understanding the invention and the concepts contributed by the inventor to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions, nor does the organization of such examples in the specification relate to a showing of the superiority and inferiority of the invention. Although the embodiment of the present invention has been described in detail, it should be understood that the various changes, substitutions, and alterations could be made hereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A system comprising:

a storage unit configured to store moving image data, the storage unit being configured to store respective summary data of a still image data file in relation to location data of each of a plurality of frames in the moving image data, the still image data file including a first area and a second area, the first area being an area in which still image data encoded from image data in accordance with an image format is stored, the second area being an area in which data of location of the image data in the moving image data and identification data of the moving image data are stored; and

a first processor coupled to the storage unit and configured to:

extract data stored in the second area in the still image data file to be verified,

search a group of summary data stored in the storage unit for summary data such that a combination of the identification data of the moving image data and the location data of the image data corresponds to the data extracted,

generate summary data for the still image data file to be verified;

make a decision whether the summary data searched for agrees with the summary data generated, and

output the decision to display; and

an apparatus including a memory and a second processor coupled to the memory,

wherein the second processor of the apparatus is configured to:

extract the plurality of frames from the moving image data, the plurality of frames being drawn in order,

encode the plurality of frames into a plurality of still image data, the plurality of still image data correspond to the plurality of frames respectively,

extract a plurality of identification data of the moving image data from the moving image data for the plurality of frames respectively,

extract a plurality of frame number data indicating a drawing sequence of the plurality of frames for the plurality of frames respectively,

extract a first still image data from the plurality of still image data,

extract a first frame number from the plurality of frames number of a first frame which corresponds to the first still image data,

extract a first identification data from the plurality of identification data of the first frame, and

generate the summary data corresponding to the first still image data, the first frame number and the first identification data.

2. The system according to claim **1**, wherein the second processor is configured to generate an electronic signature of the summary data.

3. The system according to claim **2**, wherein the second processor is configured to verify the first still image data based on the electronic signature.

4. The system according to claim **1**, wherein the summary data are hash data calculated by using a hash function.

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